Chapter 5, Section 5.2
Status and Recovery
Clearwater River Steelhead Major Population Group
in the
Snake River Steelhead DPS

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5.2 Clearwater River MPG

The Clearwater River MPG includes six independent populations (Figure 5.2-1), consisting of five extant populations and one historic population whose habitat was blocked by the construction of Dworshak Dam. The ICTRT defined steelhead in this subbasin as a single major grouping based on geography (basin topography) and several scattered genetic samples. Nevertheless, the Clearwater River includes substantial life-history diversity because it supports populations traditionally classified as both A-run and B-run. Independent populations in the Clearwater River MPG include: 1) Lower Clearwater mainstem, 2) Lolo Creek, 3) South Fork Clearwater River, 4) Lochsa River, 5) Selway River, and 6) North Fork Clearwater River. Characteristics of the populations as defined by the ICTRT (2005) are listed in Table 5.2-1.

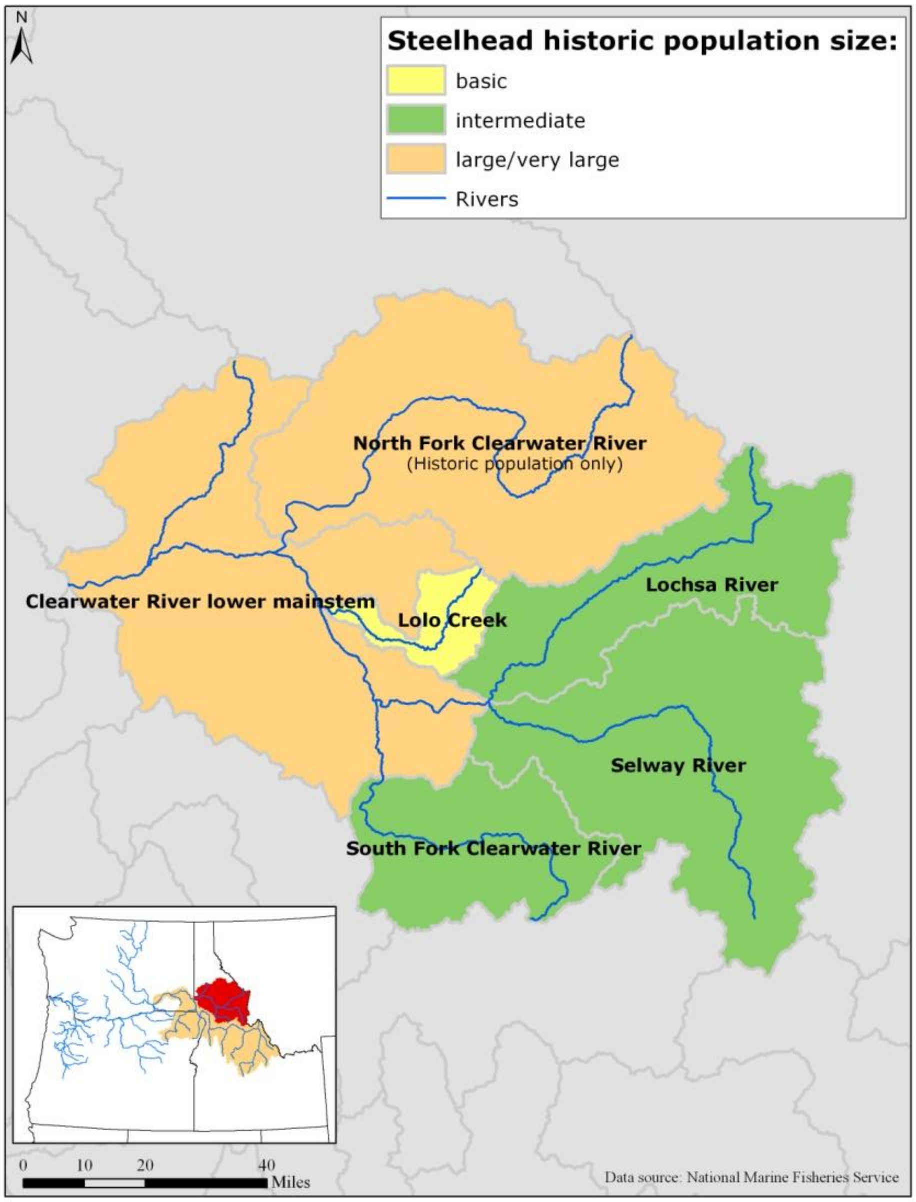


Figure 5.2-1. Clearwater River Steelhead MPG and Independent Populations.

A number of dams built in the Clearwater River drainage, beginning probably in the late 1890s, blocked or impaired anadromous fish migration. Lewiston Dam, built in 1927 on the Clearwater River near RM 4, operated until its removal in 1973. Steelhead were able to maintain access to the Clearwater River subbasin during the dam's existence and are included in the DPS. However, the dam was thought to be a partial barrier to adult steelhead migration and reduced escapement to areas above the dam. During the course of its operation, modifications were made to Lewiston Dam to facilitate fish passage. The effects of Lewiston Dam extended to all populations in the MPG. The population-specific effects of other dams that were constructed in the subbasin are discussed in later sections.

Table 5.2-1. Clearwater River steelhead MPG population characteristics. Minimum abundance and productivity values represent levels needed to achieve viable status (95% probability of persistence over 100 years.)

Population	Extant/ Extinct	Life History	Size	Threshold Abundance	Minimum Productivity
Lower Mainstem	Extant	A-Run	Large	1,500	1.56
North Fork	Blocked	B-Run	Large	-	-
Lolo Creek	Extant	A & B-Run	Basic	500	1.27
Lochsa River	Extant	B-Run	Intermediate	1,000	1.14
Selway River	Extant	B-Run	Intermediate	1,000	1.14
South Fork	Extant	B-Run	Intermediate	1,000	1.14

Migration timing of steelhead in the Clearwater MPG, and the entire DPS, has changed because of anthropogenic impacts. Water releases from Dworshak Reservoir have caused adults to hold in the mainstem Clearwater River downstream of the North Fork Clearwater River for longer periods. Construction and operation of the lower Snake River dams and reservoirs have changed temperature and flow patterns, which in turn affects both juvenile and adult migration. Upstream migration of adults in the late summer and fall is often delayed because of warm mainstem temperatures. Smolt entry into the estuary has been delayed relative to historic conditions; passage through the reservoirs requires longer migration times.

Artificial propagation programs for steelhead in the Clearwater River basin are based on the North Fork Clearwater stock, which was trapped at the foot of Dworshak Dam when the project blocked access to the North Fork in 1969. Dworshak National Fish Hatchery (NFH), located at the mouth of the North Fork Clearwater at approximately Clearwater River mile 40, has produced 2.3 million steelhead smolts annually most years since the early 1970s. About 1.2 million smolts are released directly from the hatchery and the remaining 1.1 million are released off-station. Dworshak NFH supplies fertilized eggs to Clearwater Hatchery, which produces 1.04 million smolts. Fish from Clearwater Hatchery are released in the South Fork Clearwater (including Crooked and Red Rivers) for fishery mitigation and in an experimental attempt to reestablish a natural spawning population in an area that had been blocked by dams in the last century. Hatchery-origin steelhead are rarely observed in the important steelhead production areas in the Lochsa and Selway Rivers, or in the lower Clearwater River tributaries, and are not believed to influence the natural populations.

5.2.1 Viable MPG Scenarios

The ICTRT incorporated the viability criteria (ICTRT 2007) into viable recovery scenarios for each MPG. The criteria, which are explained in detail in Chapter 3, Recovery Goal and Delisting Criteria, should be met for a MPG to be considered viable, or low risk, and thus contribute to the larger objective of species' viability. These criteria are:

1. At least one-half the populations historically present (minimum of two populations) should meet viability criteria (5% or less risk of extinction over 100 years).
2. At least one population should be highly viable (less than 1% risk).
3. Viable populations within a MPG should include some populations classified as "Very Large'" or "Large," and "Intermediate" reflecting proportions historically present.
4. All major life history strategies historically present should be represented among the populations that meet viability criteria.
5. Remaining populations within an MPG should be maintained (less than 25% risk) with sufficient abundance, productivity, spatial structure and diversity to provide for ecological functions and to preserve options for species' recovery.

The criteria suggest several viable MPG scenarios for the Clearwater River MPG:

- At least three of the MPG's six populations must be viable, and one of these populations must be highly viable for the MPG to meet the criteria.
- Because the North Fork Clearwater population is extirpated, the only Large-sized population left is the lower Clearwater River, and it must achieve viability to meet this criteria. At least two of the three intermediate-sized populations must also attain viable status.
- All life histories must be present: Initially the TRT believed that Lolo Creek was the only population that represented both the A and B run life history in a single population. Recent data, however, indicates that the A and B run life history is expressed in more populations than previously believed. As a result, this criterion will be revisited when the data is published.
- All remaining populations should at least achieve maintained status.

5.2.2 Current MPG Status

The ICTRT completed independent population viability assessments for five of the six populations in the Clearwater MPG. It then used these assessments and applied the MPG-level viability criteria to determine the current status of the MPG. This section summarizes these assessment results. Section 5.2.6 provides more detailed discussions for each independent population. The ICTRT did not assess the status of the North Fork Clearwater population since Dworshak Dam currently blocks access to the entire historical habitat area. The Clearwater River steelhead MPG currently does not meet MPG-level viability criteria because none of the populations currently attain viability (viable or highly viable status) (Table 5.2-2). All the populations are at high or moderate abundance and productivity risk.

Table 5.2-2. Viable Salmonid Population (VSP) risk matrix for independent populations in the Clearwater River steelhead MPG with current status, as determined from ICTRT population viability assessments (ICTRT 2010).

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Clearwater Lower Mainstem,	M	HR
	High (>25%)	HR	HR Lochsa, Selway	HR Lolo Creek, South Fork Clearwater	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

The assessment of abundance/productivity risk for steelhead populations is problematic because of the lack of population level abundance data for most populations. Pending the collection of better population abundance data, the ICTRT developed generic abundance/productivity risk assessments for an average A-run and B-run steelhead population. That methodology allocated the aggregate run of natural-origin steelhead at Lower Granite Dam to the various populations.

5.2.3 Viability Gap

A population's gap represents the improvements in abundance (the total number of adults) and productivity (the ratio of returning adults to the parental spawning adults) that are necessary for a population to achieve its desired status. As such, the gap is a good indicator of the level of effort needed to achieve recovery.

Gaps are measured as the necessary improvement in survival rates. More information can be found in ICTRT (2007b) regarding how the required survival changes were calculated. For each population the ICTRT quantified gaps as necessary changes in survival rates to achieve three different extinction risk levels: very low risk (Highly Viable), low risk (Viable), and moderate risk (Maintained). For each risk level, the gap is expressed as a range based on favorable and unfavorable ocean conditions, to account for uncertainty about future climate and ocean conditions.

[Section is under development]

5.2.4 MPG Limiting Factors and Threats

Many limiting factors and threats affect the viability of Idaho's Snake River steelhead during their complex, wide-ranging life cycle. NMFS defines limiting factors as the biological and physical conditions that limit a species' viability (e.g., high water temperature) and threats as those human activities or natural processes that cause the limiting factors. While the term 'threats' may carry a negative connotation, these are often legitimate and necessary human activities that may at times have unintended negative consequences on fish populations. Adjusting such activities can often minimize or eliminate the negative impacts.

This section summaries the impacts on Clearwater River steelhead populations from natal habitat alteration, hatchery programs and fisheries management. Section 5.1.1 summarizes the regional-level factors that impact all Idaho Snake River steelhead populations. Limiting factors and threats specific to individual Clearwater steelhead populations are discussed in the Population Summaries in Section 5.2.6.

5.2.4.1 Natal Habitat Alteration

[To be developed.]

5.2.4.2 Hatchery Programs

[To be developed]

5.2.4.3 Fisheries Management

[To be developed]

5.2.5 MPG Recovery Strategy

5.2.5.1 Desired Population Status

The recovery strategy for this major population group includes achieving a desired status for each population within the MPG. There are multiple viable MPG scenarios for the Clearwater River, as described above in section 5.2.1. To provide focus for this recovery plan, NMFS and the state of Idaho have selected a desired status for each population, matching one of the viable MPG scenarios. The selections are described below and shown in Table 5.2-3. It is important to note, however, that any viable MPG scenario satisfying the criterion in 5.2.1 is acceptable for achieving the recovery goal.

Lower Clearwater Mainstem

The lower Clearwater Mainstem population is the only Large population and must attain viable status to meet the TRT size criterion. It also must be selected because it is the only A-run population. The desired status for the Lower Clearwater mainstem population is ***Viable***, with low (1 to 5%) risk of extinction over 100 years.

Selway River

The Selway River population is one of three intermediate-sized populations, two of which must achieve viable status. There is very little hatchery influence on this population and the habitat is in very good shape, with much of it protected by the Selway-Bitterroot wilderness area. The desired status for the Selway River Population is ***Viable***, with low extinction risk.

Lochsa River

The Lochsa River population is one of three intermediate-sized populations, two of which must achieve at least viable status. There is very little hatchery influence on this population and the habitat is in good shape, with some streams falling in roadless areas or the Selway-Bitterroot wilderness area. The desired status for the Lochsa River population is ***Highly Viable***, with very low (less than 1%) risk of extinction over 100 years. The Lochsa was chosen to achieve highly viable status because it is more accessible than the Selway River for data collection.

Lolo Creek

The Lolo Creek population is a basic-sized population. The habitat has been more impacted by land uses than the Selway or Lochsa populations. The desired status for the Lolo Creek population is ***Maintained,*** with only a moderate (25% or less) risk of extinction over 100 years.

South Fork Clearwater

The South Fork Clearwater population is one of three intermediate-sized populations, two of which must achieve viable status. This population's habitat has been more impacted by land uses than the other intermediate populations and a state highway runs along much of the mainstem river. The South Fork Clearwater also has a higher degree of hatchery fish influence than the other intermediate-sized populations. The desired status for the South Fork Clearwater population is ***Maintained,*** with only moderate risk.

North Fork Clearwater

The North Fork Clearwater population was blocked by the construction of Dworshak Dam, and currently serves only as a hatchery population. Therefore, the North Fork Clearwater population is not is not included in any viability scenarios for the MPG.

If each population achieves its desired status, shown in Table 5.2-3, the Clearwater MPG will be viable.

Table 5.2-3. Viable Salmonid Population (VSP) risk matrix for independent steelhead populations in the Clearwater MPG, with desired status shown for each population.

Abundance/ Productivity Risk		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
	Very Low (<1%)	HV	HV Lochsa	V	M
	Low (1-5%)	V	V Selway, Clearwater Lower Mainstem	V	M
	Moderate (6 – 25%)	M	M	M Lolo Creek South Fork Clearwater	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

5.2.5.2 Recovery Strategies and Priority Actions

The recovery strategy for the Clearwater River MPG increases abundance and productivity for all populations. The VSP risk matrix (Table 5.2-2 and Table 5.2-3), shows that each population requires a decrease in abundance/productivity risk to reach its desired status of highly viable (very low risk), viable (low risk), or maintained (moderate risk). The current spatial structure/diversity risk for each population is acceptable for each population to achieve its desired status. Thus, the recovery strategy for this MPG also prevents any further impacts to spatial structure or diversity.

Increases in population abundance and productivity will come from the cumulative positive impacts of recovery actions targeting every life stage. This recovery plan groups recovery actions in the following categories: natal habitat, hatchery programs, mainstem Snake and Columbia Rivers and hydropower system, fisheries management, Columbia River estuary and plume, competition and predation, and climate change. Because all of the populations in this MPG are currently at high or moderate risk, recovery actions to increase survival will be needed from all categories.

It is important to note that the out-of-subbasin recovery actions identified to occur between now and 2018 in the recovery plan do not achieve the desired status for the populations with existing high quality habitat (Selway and Lochsa). Additional out-of-subbasin projects or actions will need to occur to further improve survival, thus increasing abundance and productivity. This means that a significant part of the recovery strategy for all MPGs is to identify and develop actions that will improve downstream survival over the next 10 years so they can be implemented in the future. These issues are addressed in more detail in the modules to the recovery plan dealing with hatcheries, harvest, hydropower and the estuary.

Natal Habitat

The Selway River population is well protected, with much of its habitat falling in the Selway-Bitterroot wilderness area. The Lochsa River population also has some degree of protection, with many streams in either designated wilderness or roadless areas. However, a state highway runs along the mainstem Lochsa River. The remaining three populations in the MPG (Lower Clearwater, Lolo Creek, South Fork Clearwater) are in managed landscapes and habitat has varying levels of anthropogenic influence.

The priority spawning and rearing habitat recovery actions in this MPG are:

1. Collect and analyze population specific data to accurately determine the population status.
2. Decrease sediment loads to spawning and rearing reaches.
3. Improve riparian conditions to increase shade and LWD delivery.
4. Remove barriers.

Other habitat actions specific to certain populations are identified in the population-level recovery plans in Section 5.2.6.

Natal habitat actions alone will not produce the increases in survival needed for this MPG to achieve viability and additional survival improvements from “downstream” of the spawning habitat in the Snake and Columbia River migration corridor, the Columbia River estuary, or the ocean are a very high priority. NMFS used the Chinook populations in the Middle Fork Salmon River MPG, which are located in designated wilderness and have nearly pristine habitat, to roughly estimate the magnitude of survival increases needed from "downstream" actions.

Hatchery Programs

[To be developed]

Fisheries Management

[To be developed]

5.2.6 Population Summaries

The following sections summarize the results of the population viability assessments completed for the five extant independent populations in the MPG. Also included for each population is a description of habitat conditions and threats to the population, limiting factors assessment and recovery strategy for the population.

5.2.6.1 Lower Mainstem Clearwater Steelhead Population

Abstract/Overview

The Lower Mainstem Clearwater steelhead population is currently rated as maintained, with only a moderate abundance/productivity risk based on assessment of a surrogate population. Its targeted desired status is viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its desired status.

Current Status	Desired Status
Maintained	Viable

The actions identified in this recovery plan to occur over the next 10 years are not likely to move this population to its desired status. Additional actions to improve survival will be necessary at all life stages for this population to achieve its desired status. The monitoring and research information collected in the next 10 years will provide an important opportunity to complete a more detailed evaluation of the status of the species and will provide additional knowledge to guide the next round of actions under this recovery plan.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Introduction

This section of the recovery plan compares the Lower Clearwater population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and DPS. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT's Snake River steelhead status assessment (ICTRT 2008).

Population Status

The Population Status section describes the population's current status as defined in the ICTRT's most current status assessment (ICTRT 2008) where they discussed risk in terms of four viability parameters: Abundance, Productivity, Spatial Structure and Diversity. Other available information was also considered. The section focuses primarily on population Abundance (the total number of adults) and Productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure (the amount and nature of available habitat) and Diversity (genetic traits) concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the Snake River steelhead status assessment (ICTRT 2008).

Population Description: This population includes tributaries to the lower Clearwater River mainstem, lower South Fork Clearwater, and lower Middle Fork Clearwater (ICTRT 2003, Figure 5.2-2). Steelhead returning to these lower elevation tributaries were assumed to be all A-run (spending one year in the ocean), and were thus differentiated based on life-history pattern from the B-run fish (two years in the ocean) returning to the upper South Fork, the Lochsa River, and the Selway River. Recent research, however, has shown a diversity of life history strategies in the Lower Clearwater. In the Potlatch River, a major Lower Clearwater tributary, IDFG reports at least nine different phenotypes, with steelhead spending one, two, or three years in the ocean (Bowersox 2011). This recovery plan summarizes the ICTRT's (2008) population status assessment, which classifies this population as exclusively A-run. As new research becomes available on steelhead life history strategies, the status assessment below will be updated to incorporate these results.

The population does not include the North Fork Clearwater or Lolo Creek drainages. A break in habitat characteristics separates this population from the North Fork Clearwater, and access to the North Fork is blocked by Dworshak Dam. Lolo Creek supports both A-run and B-run steelhead, and is considered an independent population from the Lower Clearwater Mainstem. Clear Creek, a tributary to the lower Middle Fork, presumably supported A-run steelhead historically (due to habitat similarity to other Lower Clearwater A-run tributaries), but has had recent hatchery influence from Dworshak and Kooskia Hatchery B-run fish. It was grouped with the Lower Clearwater population based on its assumed historical life history and a lack of data that would include it in any other population.

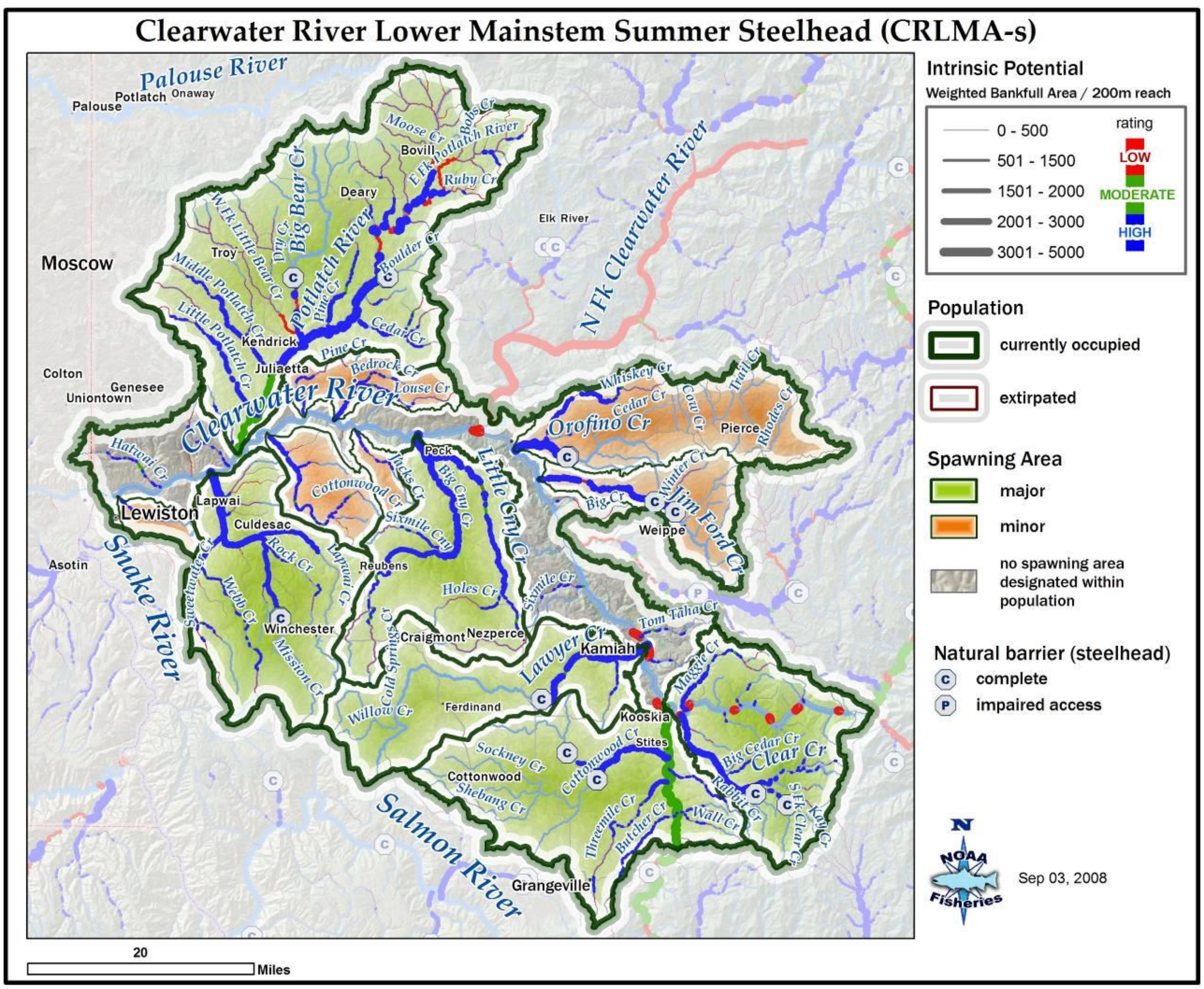


Figure 5.2-2. Lower Mainstem Clearwater River steelhead population, with major and minor spawning areas.

The ICTRT classified the Lower Mainstem Clearwater River population as "large" in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as large has a mean minimum abundance threshold of 1,500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (low risk) of extinction over a 100-year timeframe.

Abundance and Productivity: Direct estimates of current abundance (total number of adults spawning in natural production areas) are not available for this population. There are no weirs, traps, or surveys to count adult abundance across the entire population. Surveys of juvenile density or abundance are conducted in some stream reaches, and IDFG surveys adult spawners in some select tributaries to the Potlatch River. However, the numerous dispersed tributaries and potential spawning reaches make population-wide abundance estimates difficult. Furthermore, large numbers of hatchery-origin steelhead from upstream hatchery programs pass through the population in the mainstem Clearwater River, both as juveniles and adults. It is unknown how many migrating juvenile steelhead cease their migration and become freshwater residents in this population or the number of upstream migrating adults that stop short of the release locations and spawn in the population. These hatchery fish add uncertainty in estimating the abundance of the natural-origin population.

Since population-specific abundance estimates are not available for most Snake River steelhead populations, the ICTRT generated preliminary estimates of average population abundance and productivity using annual counts of wild steelhead passing Lower Granite Dam. Estimates were developed for two average surrogate populations to represent both major run types (A and B). These abundance and productivity estimates were then compared to a viability curve for an intermediate-sized Snake River steelhead population (requiring a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner). The surrogate population for A-run steelhead above Lower Granite Dam has an estimated recent abundance of 556 and productivity of 1.86. It is rated as Moderate Risk based on current abundance and productivity, as shown in Figure 5.2-3 (25% or less risk of extinction over a 100-year timeframe). Although the current estimate of intrinsic productivity is above the minimum threshold for low risk, the current average natural abundance (recent 10 year geometric mean) is well below the ICTRT minimum threshold value of 1,000. More specific information about how the abundance and productivity estimates were calculated is included in the ICTRT's steelhead status assessment, *Appendix B-1 Calculating Representative Abundance and Productivity Estimates for Snake River A and B-run Steelhead Populations*.

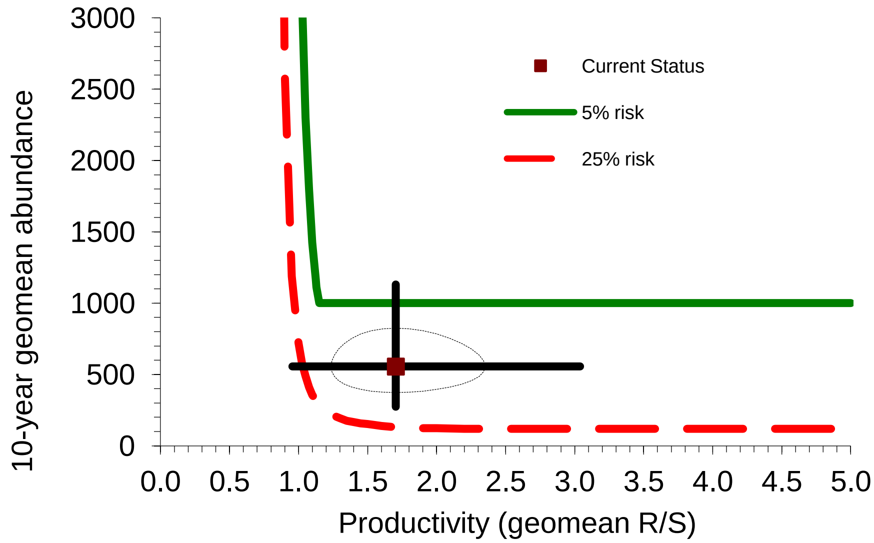


Figure 5.2-3. Snake River A-run surrogate steelhead population current estimated abundance and productivity (A/P) compared to DPS viability curve (1986-2005). Ellipse = 1 SE about the point estimate. Error bars = 90% CI for A, 98% CI for P (if point estimate >1% risk curve, the uncertainty test is <1% probability the combined A/P is at high risk).

Based on the assessment for the surrogate A-run population, abundance will need to increase for the Lower Clearwater steelhead population to reach its desired status of viable, with low abundance/productivity risk.

Spatial Structure: The ICTRT has identified six major spawning areas (Lapwai Creek, Potlatch River, Big Canyon Creek, Clear Creek, Lawyer Creek, and Lower South Fork tributaries) and five minor spawning areas (Orofino, Jim Ford, Cottonwood, Bedrock, and Lindsay Creeks) within this population. Current spawning is distributed widely across the population and is presumed to occur in all major and most minor spawning areas, including all major tributaries and numerous small tributaries. However, redd count data for the population is very limited, especially with respect to the number and frequency of surveys. Based on the extensive branching of currently occupied habitat, the spatial structure risk for this population is very low, which is adequate for this population to reach its desired status.

Diversity: Genetic data for Lower Clearwater steelhead show differentiation among sub-components within the population and clustering of those sub-components within a larger group of Clearwater River MPG samples. Additionally, lower Clearwater genetic samples showed no similarity to the single hatchery sample available, suggesting very low genetic risk for the population. Although there is no hatchery program in this population, large numbers of hatchery fish swim through the population as out-migrating juveniles or as adults returning to their original release site. It is unknown how many migrating juvenile steelhead cease their migration and become freshwater residents in this population or the number of upstream migrating adults that stop short of the release locations and spawn in the population. There is some diversity risk associated with the high degree of uncertainty regarding the contribution of those fish to natural spawning. The cumulative diversity risk for this population is low, but the risk rating could be increased to moderate, pending a more in-depth assessment of the potential hatchery-origin component of natural spawners and of impacts from recreational harvest. A low diversity risk is adequate for this population to reach its desired status.

Summary: The Lower Clearwater steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance and productivity, based on the ICTRT's average surrogate A-run population passing Lower Granite Dam. Based on this rating, increases in abundance will need to occur for this population to reach its desired status of viable. Population-specific abundance data will be necessary to increase the certainty of the abundance/productivity rating. The overall spatial structure and diversity rating of low risk is sufficiently low for this population to reach its desired status. Table 5.2-4 summarizes the population's abundance/productivity and spatial structure/ diversity risks. A complete version of the ICTRT's draft status assessment for Snake River Basin steelhead populations is available upon request from NMFS.

Table 5.2-4. Viable Salmonid Population parameter risk ratings for the Lower Clearwater steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Lower Mainstem Clearwater River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Section 5.1.1 summarizes regional-level factors that affect all Idaho Snake River steelhead populations.

Natal Habitat

Habitat Conditions: The drainage area occupied by the Lower Clearwater population encompasses 6,848 km^2 (2,644 mi^2). The drainage area has 2,426 km of streams, with about 69 percent (1,677 km) occurring downstream from natural barriers and accessible to anadromous fish. The landscape within this area is diverse, from forested mountains and hillsides to rolling prairies, with steep canyons cutting through the rolling uplands down to the mainstem Clearwater River. The region is mostly arid, with annual precipitation ranging from roughly 175 mm (7 inches) at the lowest elevations, and roughly 750 mm (30 inches) at higher elevations. Elevations within the subbasin range from 213 meters (700 feet) at the mouth of the Clearwater River to more than 1,830 meters (6,000 feet). Watershed elevation has a significant effect on the hydrology of the tributaries due to differences in the amount of precipitation and the proportion of the precipitation that occurs as snow.

Land ownership within the population is primarily private, with Nez Perce Tribal lands, USFS, BLM, and state lands making up the remaining 23 percent (Figure 5.2-4). USFS and state lands are located in the upper reaches of the Potlatch River, Jim Ford Creek, Orofino Creek, Maggie Creek, and Clear Creek. BLM lands are generally smaller tracts scattered along the mainstem Clearwater, while private is dominant throughout most of the watersheds. Nez Perce tribal lands are interspersed within mostly private lands along many of the western drainages within this population. The dominant land uses are agriculture (grains), livestock grazing, timber harvest, and rural development. Due to the steep topography, most road and housing development is concentrated in valley bottoms and on the prairie plateaus. Many streams and rivers have adjacent roads built in the valley bottom. Buildings and roads in developed areas commonly encroach on stream channels and floodplains.

The diversity of landforms creates several types of hydrologic regimes in the Lower Clearwater River Basin (Table 5.2-5). The precipitation at higher elevations tends to occur primarily as snow; a mix of rain and snow occurs at mid-elevations; and precipitation in the lower elevations tends to be predominantly rain. Watersheds with relatively high topographic relief tend to have a mix of rain and snow driven stream flows, with extreme year-to year-variation in flows. Winter rain-on-snow events are common at mid-elevations. Rain-on-snow generates flashy storm runoff, and the flashiness is intensified by road ditches and farm field drainage that generates surface runoff much faster than the natural vegetation. Flashy stream flows tend to scour the steeper stream channels and maintain a chronic state of streambed instability.

In the snow-dominated areas, accumulated snow acts as a natural reservoir that stores winter precipitation and releases it during the spring. Water from snowmelt tends to shift peak flows later into spring or early summer, and it tends to extend relatively high base-flows into the summer. None of the streams in the Lower Clearwater River basin have an entirely snow-driven flow regime, but the East Fork Potlatch River and Clear Creek have regimes that are more snow-driven than rain-driven.

Table 5.2-5. Landforms and hydrologic characteristics of major streams in the Lower Clearwater River basin.

Stream	Landform	Mid-Point elevation (feet)	Elevation at Mouth (feet)	Relief (feet)	Hydrology
Catholic Creek	Low Elevation	1842	785	2115	• Mostly rain-driven flow regime • Prone to intermittent flows in summer unless there is a significant groundwater influence
Big Creek		2092	1035	2114	
Fivemile Creek		2177	1075	2205	
Cottonwood (Clearwater)		2192	840	2705	
Pine Creek		2194	1368	1652	
Tom Taha Creek		2262	1180	2165	
Bedrock Creek	Moderate Elevation	2505	870	3270	• Mixed snow and rain flow regime tending toward rain • Summer flows vary with size of snow pack, spring rains, and timing of snow melt; sometimes intermittent
Lapwai Creek		2560	800	3520	
Big Canyon Creek		2590	960	3260	
Lawyer Creek		2996	1170	3652	
Little Bear Creek	High Elevation	3440	2720	1440	• Mixed snow and rain flow regime tending toward snow • Summer flows rarely intermittent
Orofino Creek		3535	1017	5036	
Clear Creek		3615	1262	4706	
EF Potlatch River		3638	2672	1933	

Climatic conditions in the basin are generally warmer and drier than most of the watersheds occupied by Snake River Basin steelhead. Hot dry summers are common with summer air temperatures frequently reaching over 100 degrees F in the lower elevations of the subbasin. Most of the streams in the Lower Clearwater River basin are prone to summer drought. Stream segments in the bedrock canyons sometimes have an influx of water from springs. The cool water refugia created by springs may function as core areas for steelhead production in drier years. The availability of cool water refugia is likely to be one of the more significant natural limiting factors.

Major watersheds accessible to steelhead include Lapwai Creek, Potlatch River, Orofino Creek, Big Canyon Creek, and Lawyer Creek on the main Clearwater; Cottonwood Creek on the South Fork Clearwater River; and Clear Creek on the Middle Fork Clearwater. Numerous smaller tributaries also provide steelhead habitat. Several tributaries, such as Orofino Creek and Jim Ford Creek, have natural barriers to steelhead migration in their steep canyon reaches.

Steelhead habitat conditions in the Lower Clearwater River basin span a wide range of quality, with moderate to high amounts of impairment in many watersheds. Habitat modifications are greatest in watersheds where there is a concentration of urban and rural developments in the valley bottoms, intensive crop production, or intensive timber management. Habitat conditions are modified the least in watersheds with large amounts of mature forest or lightly-roaded lands at higher elevations, and in many of the steep canyons that have bedrock-controlled stream channels and undeveloped side slopes. Some of the more significant habitat modifications affecting steelhead include reduction in habitat complexity and reductions in summer stream flows. Many of the streams in the basin also do not meet various Idaho water quality standards (IDEQ 2009), with widespread problems with sediment, high temperatures, and nutrient enrichment. Water quality impairments tend to be greatest in drainages with municipal water treatment plants, large amounts of runoff from croplands, or in stream segments downstream from livestock pens located in riparian areas.

High quality spawning and rearing habitats are scattered throughout the basin. Most streams have at least a few areas of high quality habitat, even when the stream as a whole has relatively poor habitat conditions. High quality habitat areas typically occur in stream reaches that have an influx of groundwater or high rates of exchange between surface and subsurface flows and step-pool morphology, similar to settings described by Torgersen et al. (1999) and Nielsen et al. (1994). These high quality areas comprise a small fraction of the habitat area, but they may account for the majority of steelhead production in the Lower Clearwater River basin. The number and extent of high quality areas have likely been reduced from activities that have altered stream channel morphology, reduced woody debris recruitment, or increased flashiness. High quality areas are focal points that can occur in streams that have mostly poor habitat, and the significance of these areas is often not apparent without a comprehensive habitat inventory.

Current Habitat Limiting Factors: Steelhead production in the Lower Clearwater River basin is likely limited by the availability of high quality rearing habitats. Recent fish surveys and habitat inventories by the Nez Perce Tribe and various agencies typically find many stream reaches with very few juvenile steelhead, and a lesser number of reaches with very high juvenile steelhead densities (Bowersox 2008; Bowersox and Brindza 2006; Bowersox et al. 2007, 2009, 2011; Chandler 2004, 2009; Chandler and Parot 2003; Chandler and Richardson 2005, 2006). Although juvenile steelhead are widespread in virtually all streams that are large enough for adult steelhead to spawn, a large proportion of the juveniles appear to be concentrated in a small number of high quality areas.

High quality rearing habitats are those that have habitat complexity from features such as pools, perennial stream flow, favorable water temperatures, normative channel morphology, and instream cover from wood, rocks, undercut banks, overhanging vegetation, or turbulence. High quality habitats are created and maintained from natural channel-forming processes that are dependent on the rate of sediment supply, annual hydrograph (timing and volume of flows), cycles of floodplain inundation, and riparian vegetation. The processes creating high quality habitats have been altered from land uses that increase sediment and runoff flashiness; decrease stream flows, riparian shade, and large wood recruitment; or directly alter stream channels by levees, channelization, and straightening streams. Water quality problems and impassable culverts are occasionally limiting factors at a local scale. Table 5.2-6 summarizes habitat attributes that are limiting steelhead production, describes the mechanisms by which each limiting factor affects steelhead, and lists management objectives for addressing each limiting factor.

Table 5.2-6. Attributes of high quality habitats that are limiting steelhead in the Lower Clearwater River basin and management objectives for increasing high quality habitats.

Habitat Attribute	Effects on Salmonids	Management Objectives to Address Limiting Factors
Water Temperature	Excessive temperature in summer precludes use of many streams that could otherwise be used by steelhead. Steelhead cannot survive in warmer streams unless they can find pools that have an influx of cool water from springs or seepage through gravels. In areas where steelhead are incapable of finding thermal refugia in summer, they are subjected to temperature stress that results in lower growth rates and higher mortality.	Reduce thermal inputs by increasing shade. Increase heat capacity of streams by increasing stream flows that are reduced by water use. Increase heat dissipation to groundwater by restoring processes that create pool and gravel bar formation. Consider substituting pool-forming structures only when circumstances preclude restoration of natural processes within the foreseeable future.
Instream flow	Many streams that were historically perennial now often have discontinuous surface flows during the summer. Low stream flows reduce the amount of area available for invertebrate production and steelhead rearing. Steelhead in disconnected streams can become trapped in isolated pools that kill fish through temperature stress, starvation or exposure to predators.	Identify possible surface water users and work with the users to find for opportunities to increase stream flows. Possible solutions include switching domestic water supply to deep wells, xeriscaping, and reducing water use with devices such as timers, sprinklers, and moisture meters to optimize water use.
Flow timing	Cultivated fields, paved surfaces, drainage tiles, and road drainage systems decrease water infiltration, and accelerate runoff. The combined effect of these alterations is extreme flow variation, a reduction in the amount of water stored in soils, and ultimately a reduction in base stream flows.	Uncouple artificial drainage systems from natural drainage systems. Increase ground cover on croplands by methods such as retaining stubble, planting alternative crops, and reducing tillage.
Sediment supply	Runoff from croplands and road drainage ditches deliver sediment to stream channels in excessive amounts and at times when sediment inputs are not coupled with stream flows capable of transporting the sediment. Excess sediment likely impairs spawning success and reduces invertebrate production.	Systematically reduce sediment by: (1) Inventory sediment sources; (2) prioritize areas for sediment reduction; and (3) contact landowners to identify and implement steps to reduce erosion and sediment delivery.
Floodplain connectivity	Naturally-functioning floodplains remove fine sediments, reduce the energy of floods, and provide a reservoir of large woody debris. Streams that lose their floodplains become	Remove levees that are unnecessary or not functioning; or move desired levees farther away from the stream.

Habitat Attribute	Effects on Salmonids	Management Objectives to Address Limiting Factors
	simplified by channel incision.	Restore incised channels to reestablish a functioning floodplain.
Riparian vegetation	Riparian vegetation provides a variety of functions such as shade, instream cover from overhanging plants, tree roots, and woody debris that falls into the stream, streambank stability, and food from insects that fall from overhanging plants. Riparian functions have been lost or extensively altered throughout the basin from a myriad of land use activities and floodplain development.	Offer incentives and assistance to landowners to reduce activities in riparian areas that affect riparian vegetation. Restore riparian vegetative communities
Habitat complexity	Habitat simplification is an overarching problem limiting steelhead production in the Lower Clearwater River basin. Complex habitats support higher diversity and production of invertebrate species, and they are capable of supporting higher densities of steelhead.	Where reduced habitat complexity cannot be improved by fixing other habitat elements in this table, where natural processes are precluded by roads or other developments, or where natural recovery would occur too slowly, substitute artificial rock or log structures for natural features.
Migration Barriers	Many stream segments historically used by steelhead are likely to be inaccessible to steelhead due to culverts or bridges that block upstream fish movements during some or all times.	Inventory culverts and bridges to identify existing barriers Replace bridges or culverts impeding fish passage by offering assistance to landowners.

1. Elevated Water Temperature.

Stream temperature impairments within the population are a widespread problem. Excessive stream temperatures in the lower Clearwater River basin are partly a natural phenomenon that is worsened by land use practices such as grazing, agriculture, timber harvest, water use, and floodplain development. Land use practices have worsened water temperature problems by increasing solar heat inputs by reducing the amount of shade; reducing the heat capacity of streams by reducing stream flows; reducing heat losses to the ground by altering mechanisms that create pools and gravel bars; and reducing the availability of thermal refugia through activities that reduce channel complexity.

IDEQ lists a total of 1,447 miles of stream for temperature impairment in the Lower Mainstem Clearwater River steelhead population (Figure 5.2-4). TMDLs for temperature have been designated for the lower South Fork Clearwater, Jim Ford Creek, and upper Lapwai Creek (IDEQ 1999, IDEQ et al. 2000, IDEQ 2003). In upper

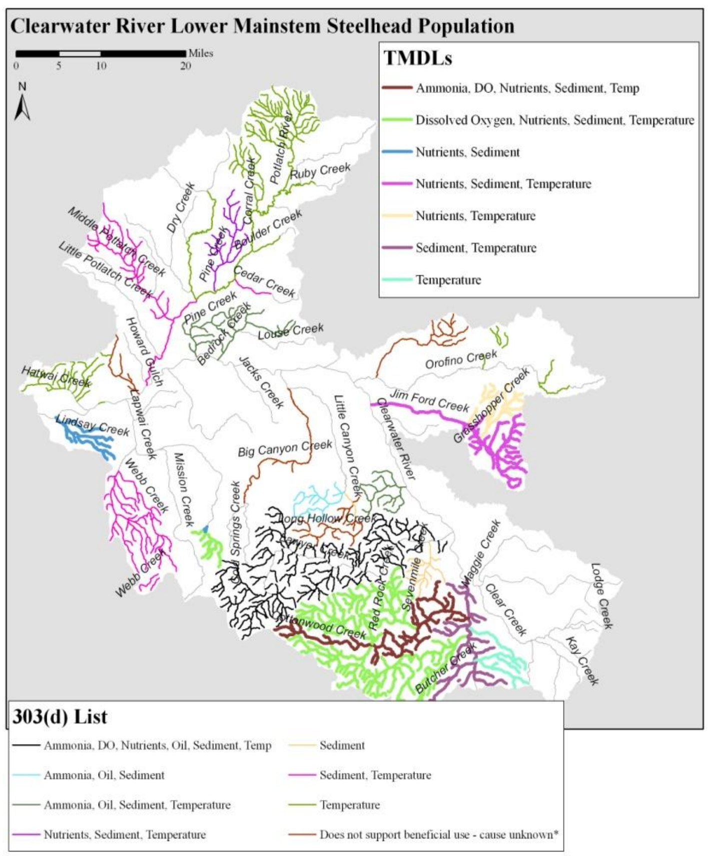


Figure 5.2-4. Stream segments in the lower Mainstem Clearwater River steelhead population identified from Section 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Lapwai Creek activities such as riparian vegetation removal, timber harvest, and grazing in riparian areas have probably increased the amount of solar radiation entering streams (IDEQ 1999). IDEQ (1999) indicated that increased shade is necessary in order to attain and maintain state water quality standards in Jim Ford Creek, lower South Fork Clearwater River, and Lapwai Creek. However, high summer air temperatures are likely to cause water temperatures to exceed state standards in lower Lapwai Creek and Jim Ford Creek on occasions when air temperatures remain near 100° F for extended period, regardless of shade. Improvements in channel complexity and possibly increases in flow may also help to decrease stream temperature.

Excessive water temperatures in the summer adversely affect salmonid growth and development, and may alter life history patterns and cause delayed or direct mortality (Spence et al. 1996). Water temperatures in lower Clearwater River tributaries commonly reach levels that can cause stress-related fatalities if fish are unable to find pockets of cooler water that serve as thermal refugia. Thermal refugia are likely to be crucial areas limiting steelhead survival in many streams within the Lower Clearwater River basin. Thermal refugia have been lost from reduced channel complexity and reduced stream flows. Excessive summer stream temperatures are a widespread problem in the Lower Clearwater River tributaries that potentially reduces abundance and productivity of steelhead throughout much of the population. Although temperature problems are widespread, pockets of thermal refugia apparently exist in most streams since elevated temperatures do not appear to have a significant effect on spatial structure within the population. Restoring thermal refugia should be a primary restoration goal in streams with excessive summer temperatures.

Stream temperature impairment occurs in almost all major and minor spawning areas within this population. Riparian habitat and stream channel restoration will be needed to reduce the effects of high summer stream temperatures on steelhead. Riparian shade should be increased as much as possible, but in many tributaries, significant decreases in water temperature are not likely to be achievable with existing land uses. Where average stream temperatures cannot be sufficiently reduced by increasing shade, temperatures may be reduced locally by restoring pool and riffle formations that force the exchange of surface and subsurface flows. Restoration of thermal refugia is likely necessary to achieve significant increases in steelhead production in this population.

2. Reduced Flow during Critical Periods.

Anecdotal historical accounts of people residing in the area typically describe higher summer flows in decades past, including examples where people used to fish in streams that today are completely dry in summer. Many of the small and intermediate-size streams that support steelhead in this population area develop intermittent or discontinuous surface flows during summer. Low stream flows are a cumulative effect of watershed alterations, climatic conditions, and water usage. Low flows are problematic throughout the population area, but are most prevalent in populated valleys at low elevations and watersheds with significant amounts of cultivated lands. In populated areas, consumptive water use likely has a significant effect on stream flow through withdrawals of surface water for irrigation and wells that are hydrologically connected to surface flows. In agricultural areas, conversion of natural prairies and meadow systems to cultivated fields has likely reduced the amount of water infiltration and storage from these important areas. In the Lapwai Creek drainage, the Lewiston Orchards Irrigation district diverts a significant amount of surface water out of the basin. Improvements to instream flows have restored surface connectivity in Sweetwater and Webb Creeks, but the water losses continue to contribute to flow problems in Lapwai Creek.

Data regarding surface flows and water use are lacking for nearly all streams in the population area. Water users are not required to monitor or report actual water usage. The degree to which water usage is affecting streamflows is unknown, except in the Lapwai Creek drainage where multiple stream gages are used to monitor stream flows and water usage by the Lewiston Orchards Irrigation District. Sporadic stream gage records are available for stream gages in the Potlatch River drainage. Strategies to improve instream flows should include initial efforts to estimate water usage and its effects on surface flows.

Restoration of instream flows is a challenging problem in this basin since the demand for domestic water usage likely stems primarily from residential developments and non-commercial irrigation. Gains in surface flows can be obtained if existing water users find ways to use less water. Recovery efforts should be focused on raising water user's awareness of stream flow problems and assisting water users with developing ways of reducing water use. Stakeholders interested in increasing instream flows could offer to landowners a voluntary "water audit" as a preliminary means of assessing water usage and identifying specific measures that would reduce water usage. Groups with technical expertise such as the Nez Perce Tribe, IDFG, IDWR, Natural Resources Conservation Service, and county soil and water conservation districts would be well-suited to providing technical advice and assisting landowners obtain any grants or financial assistance that is available for water conservation.

3. Altered Hydrology, Flow Timing.

Streamflows vary naturally with seasonal patterns in precipitation, including periods when precipitation occurs as snow or rain. In the population area, precipitation is generally greatest from November through January, lowest in July and August, and intermediate in the remaining months. Winter precipitation is roughly three to four times greater in winter than in summer. Under natural conditions, native vegetation and snow accumulation retard the movement of water into streams. The time lag from the point when precipitation falls to the point when it enters a stream may be delayed up to several months from accumulation of snow and movement through soils. The majority of land use practices in this population area reduce the lag time and create "flashy" stream flows that rapidly change with storm events. Alterations in vegetative cover from farming, forestry, grazing, roads, and urbanization generally decrease the amount of water that infiltrates into soils, and increase the volumes and rates of runoff from snowmelt and rainfall. Prominent hydrologic alterations include creation of impervious surfaces from buildings, paved roads, and parking lots; drainage tiles in agriculture fields that remove water from the soil; channelized streams that drain water more readily than natural channels with connected floodplains; alteration of vegetative cover that slows water delivery to the ground; and road ditches that capture surface runoff and infiltrated water which flows directly into streams instead of moving through soils.

The combination of low elevation, snow accumulation, rain, and rain-on-snow events makes the timing of annual peak flows highly variable, ranging from early December through late May. This variability has likely increased from warmer winters that have become more common in recent decades. The annual hydrograph for some streams has changed to one that reflects higher spring runoff peaks, flashy storm-related stream flows, and lower summer and base flows. Ecovista et al. (2003) reported that flow variations in the lower Clearwater are greatest in tributaries to the Camas Prairie where minimum mean monthly discharge can be expected to comprise less than 10 percent of the mean annual discharge. Extreme flow variations in the dry grassland environments of the Camas Prairie may be somewhat natural although this can be exacerbated by watershed disturbance. Loss of riparian vegetation and replacement of perennial grasses with annual crops in prairie and meadow environments has resulted in more overland flow and less infiltration, which translates at a watershed level to higher peak flows that subside more quickly than in the past (Black et al. 2003).

Drainage networks develop over time in response to precipitation and runoff patterns. The shift toward flashier runoff creates floods that would not normally occur, it increases the sediment transport capacity of streams, and makes streams more susceptible to summer drought. Increased flood frequency and flood magnitudes causes stream channels to become larger, which makes summer flows more shallow than normal because the streamflows are spread over a wider area. The shallow water is more readily heated by the sun, which contributes to temperature problems and low stream flows from increased evaporation. With increased flashiness, summer droughts become more frequent and more severe since the water from spring rains and snowmelt is carried out of the drainage system long before late summer when stream flows are at their lowest. In natural systems, water from spring rains and snowmelt that infiltrates soils often continues to seep into streams during summer. Large flood flows increase the sediment transport capacity of streams making them prone to scouring. Flashiness has reduced fish habitat complexity in many streams where scouring has created unstable pools and riffles, and increased flows wash away logs that stabilize channels, create pools, and provide cover for fish.

IDEQ (2009) currently lists about 876 stream miles for stream flow alterations. In general, these streams are within the Potlatch River, Lawyer Creek, Lapwai Creek, Pine Creek, Jim Ford Creek, and Lower South Fork Clearwater River tributaries. IDEQ (2009) does not indicate the types of flow regime alteration that occurs for each stream segment. However, in the Potlatch watershed management plan, hydrograph modification was indicated as a limiting factor (RPU 2007). In the Potlatch River drainage, it was suggested that the natural hydrograph has been altered by timber management practices, agriculture practices, mining activities, and urbanization, all of which have resulted in changes to vegetative cover, soil compaction, channel modifications, and changes in storage capacity (BLM 2000, as cite in by the Idaho Soil Conservation Commission (ISCC) 2010). They report that the current hydrograph reflects a flashy system where runoff occurs quickly with instantaneous discharges of 8,000 cfs in winter and early spring followed by late summer flows less than 10 cfs. As reported in ISCC (2010) discharge modeled for a five-year 24-hour storm was estimated at 850 cfs under pre-settlement ground cover and canopy conditions (U.S. Soil Conservation Service 1994 as cited in IDEQ 2010). The same storm event under present land cover conditions has an estimated peak of 2,980 cfs. Total discharge for this peak was calculated at 1,265 acre-feet for the historic conditions and 3,720 acre-feet for present conditions (RPU 2007, as cited in ISCC 2010). Their assessment indicates that these type of flows lead to a very high movement in bedload, suspended sediment, and organic debris and bedload deposition resulting in pool filling, channel erosion, and an overall loss in aquatic diversity (BLM 2000 as cited in RPU 2007). Similar changes in hydrology pattern have been predicted as a result of land cover change in the Cottonwood Creek drainage, which is a tributary to the lower South Fork Clearwater (IDEQ et al. 2000). Extreme flow variations are also likely in streams with similar landuse and precipitation patterns.

Stream flashiness is likely to be permanently higher than normal as long as existing land uses and developments continue. Few efforts have been made to reduce flashiness. Efforts to minimize alteration in flow timing and flashiness should be focused on raising the awareness of landowners and local governments about hydrologic modifications, and assisting interested parties with developing actions to reduce flashiness. Flashiness can be reduced in many areas by disconnecting artificial drainage systems from natural drainage systems, reducing the amount of impervious surfaces, and increasing vegetative cover on agricultural fields.

4. Excess Sediment.

Elevated sediment delivery to streams is prevalent throughout the population area, but sediment accumulation in streams is likely to be a limiting factor largely in low-gradient stream reaches. Elsewhere, sediment is likely to be a secondary problem at this time since sediment transport capacity has been increased in many streams (as described above) to the extent that there is little deposition of fine sediment. If flashiness is reduced, sediment deposition in stream channels is likely to increase. In short, accumulation of fine sediment in stream channels can be a significant problem for anadromous fish since it fills voids in gravels that are used by anadromous fish for egg deposition and incubation, and cover, and it eliminates gravel surfaces used by aquatic invertebrates.

The general effects of fine sediment deposition on steelhead and other salmonids are well-established in scientific studies. There is extensive scientific literature on sediment transport, erosion, and biological effects, with an excellent review by Waters (1995). Fine sediment deposition fills the spaces between gravel particles, which diminishes the space that would otherwise be used by fish for cover and for production of invertebrate prey species. Excessive amounts of fine sediment in spawning gravels reduces survival of eggs in redds, and in rearing areas, excess sediment reduces the growth and survival of juvenile steelhead.

Prominent sediment sources in this population area include farm fields and roads. Roads generate erosion from unpaved surfaces, unvegetated cuts, fills, and drainage ditches. Sediment delivery to streams can be reduced by decreasing soil erosion, or by routing sediment-laden runoff away from streams and onto land surfaces where the sediment can accumulate. Efforts to reduce sediment should be focused initially on identifying streams where sediment is presently a limiting factor and identifying sediment sources. Once sediment sources have been identified, site-specific plans to reduce erosion or to reduce sediment delivery to streams should be developed and implemented. Sediment reduction practices are well established and pertinent information is available from sources such as county extension offices, local soil and water conservation districts, Natural Resources Conservation Service, and through the internet or libraries.

5. Reduced Floodplain Connectivity.

Many streams in the population area lack functioning floodplains due to construction of levees or deepening channels for flood control, or incidental effects of filling floodplains to accommodate building, roads, parking lots, and other developments. Floodplains play an important role in the processes that create stream channels and many physical features important to aquatic organisms such as steelhead. Naturally functioning floodplains remove fine sediments from streams, reduce the energy of floods, and provide a reservoir of large woody debris and other organic materials. When streamflows are prevented from flowing onto floodplains by levees or deepening stream channels, the erosive energy of the stream is significantly increased during floods. The excess energy in confined streams causes streams to erode the banks or stream bottom.

Recovery efforts should be focused on preventing additional floodplain losses and improving floodplain functions where feasible. Restoration opportunities exist in circumstances where unnecessary floodplain fills can be removed; where levees are ineffective for flood control or levees can be set back a greater distance from the stream; and where new floodplains can be established channels within incised channels.

6. Degraded Riparian Conditions.

Riparian functions have been lost or extensively altered throughout the basin from a myriad of land use activities and structures that have replaced or eliminated the natural vegetation. In TMDLs developed to improve stream temperature conditions, IDEQ regularly establishes target levels for riparian vegetation to increase stream shade. In Lapwai Creek, IDEQ (1999) indicated that a 38 to 87 percent increase in shade would be necessary in order to attain and maintain state water quality standards. In Lapwai Creek, riparian conditions were impaired by active and unstable channels, logging and grazing activities, and levee and road prism encroachment (Chandler and Richardson 2006). In Jim Ford Creek, IDEQ (1999) estimated that a 52 percent increase in shade was necessary to meet current water quality criteria. In the Potlatch Watershed Management Plan, riparian/floodplain restoration was common implementation strategy. The benefits of restoration where to provide shade, increase LWD recruitment, reduce streambank erosion, increase instream habitat complexity, and maintain adequate stream discharge (RPU 2007 VII p. 11-68). For the mainstem Potlatch River, there is essentially no streamside cover provided by vegetation in the lower watershed because of high, scouring spring runoff, which precludes the establishment of riparian habitat (Johnson 1985 as cited in RPU 2007).

7. Reduced Habitat Complexity.

The structural complexity of the stream environment influences the number of species that can live in the stream and it often influences the productivity of those species (Smokorowski and Pratt 2006). Complex habitats have a wide array of structural features that come from variability in characteristics such as water depth and velocity; stream width; angle of the streambank; size, shape, and arrangement of streambed materials; and sheltered areas created by logs, rocks, turbulent water, and overhanging vegetation. Structural diversity is needed to create the types of environments that are required by different phases of salmonid growth and development in streams. Adults require sufficient depth to reach spawning areas. Spawning areas require physical features such as meander bends, rock or log steps, and scour pools to create deposits of suitably-sized gravels and hydraulic conditions that keep water flowing through redds. Fry require shallow, slow-moving water with abundant cover during their first summer. As juveniles increase in size, they require deeper, faster water, and low-velocity resting places created by rocks, LWD, or pools. During winter, juveniles require hidden spaces between rocks, or under logs or undercut banks that have low velocities and an influx of ground water that stays above freezing. Altered stream channels often lack the important habitat components that are needed to sustain the abundance and productivity of steelhead. Where habitat complexity is reduced, fish growth and survival may be reduced from exposure to harsher conditions and scarcer food resources.

Reduced habitat complexity is a widespread concern throughout many watersheds of this population. Reduced habitat complexity is caused by the cumulative effects of alterations to stream flows, stream channels, floodplains, sediment supply, and riparian vegetation, but in some locations, it is a direct result of intentionally channelizing and straightening streams to accommodate floodplain development or for flood control. Habitat complexity varies substantially in the population area, with the highest complexity in forested streams with low road density, and a nearly complete loss of complexity in streams that have been converted into uniformly-shaped drainage ditches. In general, losses of habitat complexity mirror the amount of development in the floodplains, and all major streams in the population area have suffered losses in habitat complexity wherever floodplain development exists.

As an example, land use and watershed development in the Lapwai Creek drainage have changed stream temperature and flow regimes (BLM 2000, Chandler and Richardson 2004, Chandler and Richardson 2006), and altered the shape, size, and gradient of many streams. Changes in flow regime have reduced habitat complexity by increasing the intensity and frequency of stream channel scouring (BLM 2000). Much of lower Lapwai Creek from the mouth upstream above the confluence of Mission Creek, is confined by U.S. Highway 95, a railroad line, and multiple U.S. Army Corps of Engineers levees (Chandler and Richardson 2004). The straightened channel lacks meanders and pools, and the streambed has become a uniform assortment of gravel sizes rather than a series of distinct habitat units that are distinguished by changes in gradient, depth, sinuosity, and substrate size that occur in a naturally functioning stream. In upper Lapwai Creek, the stream flows through a narrow canyon where U.S. Highway 95 is built, and the highway forces the stream into a straighter, steeper stream than would naturally exist. The stream has lost the ability to carve meander bends. Removal of riparian trees in the road right-of-way also reduced large wood recruitment that could improve stream channel complexity.

Strategies to restore habitat complexity should be tailored to changing the activities or circumstances that have caused the losses in complexity, rather than increasing complexity by installing artificial structures that do not alleviate the cause of the problem. Artificial structures should be considered as a last resort when roads, buildings or other permanent alterations preclude restoration of processes that create and maintain structural complexity in streams. A systematic evaluation of watershed conditions should be performed to identify the activities or circumstances that have reduced habitat complexity before planning restoration projects of this nature. An excellent source of guidance for evaluating watershed conditions and planning restoration activities is available online at the following location: http://www.restorationreview.com.

8. Migration Barriers.

A great deal of work has been done fixing known migration barriers, but there are likely still potentially miles of steelhead habitat in the population area blocked entirely or partially by artificial migration barriers. Artificial migration barriers in the population area are most commonly caused by impassable culverts at road crossings and dry stream channels caused by water use. Restored access to this habitat provides a definable and immediate benefit that can rapidly increase steelhead abundance and productivity and while many of the known passage barriers in the population area have repaired, a full inventory of passage barriers could be very beneficial. Road densities displayed in Ecovista et al. (2003 p. 94-95) show a fairly high road density throughout much of the Lower Clearwater Mainstem steelhead population. Estimated culverts counts appear to be relatively high (26-75/subwatershed) throughout this population particularly in the Potlatch River drainage, lower Clearwater River tributaries and South Fork Clearwater tributaries (Ecovista et al. 2003 p. 354).

Migration barriers were identified as a limiting factor in three watershed assessments (Lapwai Creek, Potlatch River, and Big Canyon Creek) and it is likely they limit access to potential steelhead habitat throughout the population. In the Potlatch Watershed Management Plan four natural fish migration barriers exist within the watershed (RPU 2007). The natural barrier falls exist on Boulder Creek (RM 1.2), Middle Potlatch Creek (RM 8.0) and Big Bear Creek (RM 5.6). The last barrier is the result of a rockslide that occurred in 1980 at river mile 2.5 on Little Potlatch Creek (Johnson 1985 as cited in RPU 2007). Other migration barriers indicated in the Potlatch Watershed Management Plan occur from a constructed dam on upper West Fork of Little Bear Creek and a box culvert under the railroad grade on Corral Creek near the town of Helmer (which was removed in 2007). The Plan also indicated, but did not list the many road culverts throughout the Potlatch River watershed that may act as migration barriers throughout low flow periods (RPU 2007). Some of the culvert barriers exist upstream from the natural barriers mentioned, which would indicate that they are not a priority in steelhead recovery.

In the Lapwai Creek and Big Canyon Creek watersheds numerous potential and known migration barriers were identified (Christian and Taylor 2004, Taylor 2004). There was 123.4 miles of stream surveyed within the Lapwai Creek watershed evaluating 208 sites for barrier status. Taylor (2004) estimated that 60 percent (72.6 miles) of the stream miles were blocked by barrier structures. During the survey, different types of barriers were noted representing transient, seasonal and permanent migration barriers. Temporary barriers varied from handmade wood dams to culverts plugged with debris at the inlet. Christian and Taylor (2004) surveyed 119.6 miles evaluating 79 sites for barrier status within the Big Canyon Creek watershed. They determined that nearly 30 percent (35.8 mile) of the stream miles were currently blocked by barrier structures. Christian and Taylor (2004) also expressed concerns that many culverts may need replacement because they are too small. Larger culverts designed to pass more flow (100 yr storm event) and debris would reduce the risk of road failure.

Summary of Current Habitat Limiting Factors and Threats
Critical habitat in the Lower Mainstem Clearwater River basin population has been altered by a wide array of past and present land use activities such as agriculture, timber harvest, and livestock grazing, and developments such as housing, roads, railroads, and flood control structures. Habitat problems vary in different locations, but in general, elevated summer water temperatures, low summer stream flows, and loss of habitat complexity are likely to be the most significant factors affecting steelhead production in the population area as a whole. Individual streams often have other problems as well, and restoration activities in any particular stream should be tailored to the primary causes of habitat alterations that are identified though an analysis of watershed conditions.

Potential Habitat Limiting Factors and Threats: Several potential concerns have not yet risen to the level of limiting factors, but need to be managed to protect spawning and rearing habitat, and to allow any degraded habitat to recover.

1. Degraded floodplain connectivity and function from expanding road network. Expansion of the road networks includes widening roads that already encroach on streams or floodplains and development of new roads. Most major highways are located in valley bottoms where there is little room to increase road width without further encroachment on streams or floodplains.

2. Degraded floodplain function and connectivity from development. Expansion of floodplain development from new housing, barns, corrals, feedlots, and commercial buildings.

3. Reduced flow in critical times due to increased surface water consumption. In this largely rural setting, new floodplain developments generally require wells, which are sometimes connected to surface flows. New lawns and gardens are also often irrigated with surface waters pumped from streams.

Hatchery Programs

[To be developed]

Harvest Management

[To be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next ten years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

Priority stream reaches: Watersheds with the highest priority for restoration are streams that have relatively high natural base flows and high intrinsic potential for production. These watersheds include the Potlatch River, Clear Creek, and Big Canyon Creek. Upper Lapwai Creek, and other streams or watersheds that presently have high steelhead densities or where site-specific data indicates a high potential for production.

Site-specific restoration priorities should be established from watershed plans developed from stream and fish population inventories. One of the first steps should be to complete fish and habitat inventories in high priority watersheds that presently do not have site-specific plans, or that have incomplete or outdated information. The Nez Perce Tribe and the IDFG have been systematically surveying streams in the population area. This information has been crucial in establishing habitat conditions, limiting factors, and centers of existing and potential steelhead production. Information gained from the inventories has been used in conjunction with locally-developed restoration plans such as the Potlatch River Management Plan (LSWCD 2007), and restoration strategies developed by the Nez Perce Soil and Water Conservation District and Nez Perce Tribe for Big Canyon Creek watershed (Rasmussen and Richardson 2007), and Lapwai Creek drainage (Richardson et al. 2009). An ad hoc technical advisory group consisting of state, federal, and tribal biologists, and other regional stakeholders has been instrumental in identifying priorities for restoration activities, fish and habitat inventories, and for monitoring effects of restoration projects.

Habitat actions: Whenever feasible, recovery activities should be designed to preserve, restore, or rehabilitate natural habitat-forming processes (i.e. flood frequency and magnitude, sediment supply, and recruitment of large woody debris). When natural processes are compromised by irreversible alterations, such has highways or homes, or when time needed to recover natural processes is too long, artificial structures may be appropriate substitutes for missing habitat components. At the subbasin scale, the general priorities for restoration are as follows:

1. Restore hydrologic processes to retain surface flow by reducing surface runoff from altered land surfaces, disconnecting artificial drainage systems from natural drainage systems, and modifying water uses. This will contribute to reducing stream temperature problems

2. Restore channel-forming processes by reestablishing floodplains in incised channels, removing or setting back flood control structures, and rehabilitating stream channels that have been straightened.
3. Reestablish riparian vegetation to improve LWD recruitment and create shade for streams.
4. Reduce fine sediment delivery to streams where it is increased caused by agriculture, road drainage systems (including undersized culverts), or other artificial sources.
5. Inventory, prioritize, and eliminate remaining artificial fish migration barriers.

Implementation of Habitat Plan

No habitat projects are currently proposed for the Lower Clearwater steelhead population. Implementation of recovery activities is voluntary on state and private lands, and would be conducted by interested parties such as the Idaho Department of Fish and Game, Idaho Department of Environmental Quality, Idaho Department of Lands, Nez Perce Tribe, and county soil and water conservation districts, private landowners, and other interested parties. Recovery actions on non-Indian lands within the Nez Perce Tribal Reservation should be coordinated with the Nez Perce Tribe. Recovery actions on federal lands are mandated by a variety of federal laws, policies, and regulations, including the ESA, which requires federal agencies to utilize their authorities to further the purposes of the ESA. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watersheds of this steelhead population.

Many stream habitat restoration projects have been completed in the Lower Mainstem steelhead population area, under the direction of local, county, state, tribal, and federal programs. In the Potlatch drainage, stream habitat restoration projects have been conducted on private, state, federal, and tribal lands, including riparian fencing, riparian plantings, road obliterations, and culvert replacement (IDEQ 2008). The Nez Perce Soil and Water Conservation District and Nez Perce Tribe have been actively involved in monitoring stream conditions, identifying problems, and implementing stream restoration projects within the Lapwai Creek and Big Canyon Creek drainages. Recent projects in the Lapwai Creek and Big Creek drainages have included erosion control structures, barrier removals, riparian planting and seeding, livestock fencing and alternative water source development, dike removal and reconnection of streams to floodplains, and road decommissioning (Dau et al. 2010, Rasmussen and Garrison 2009, Hills and Peterson 2011, Hills and Peterson 2010, Werlin 2007).

Habitat Cost Estimate for Recovery

No habitat projects are currently proposed for the Lower Clearwater steelhead population, and thus no short-term habitat costs have been calculated for this population.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

5.2.6.2 Selway River Steelhead Population

Abstract/Overview

The Selway River steelhead population is currently rated as not viable, with a high abundance/productivity risk. Its targeted desired status is viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its desired status.

Current Status	Desired Status
High Risk	Viable

The actions identified in this recovery plan to occur over the next 10 years will likely move this population to maintained, but additional actions will be needed for the population to achieve its desired status of viable. Additional improvements in survival may come from the spawning and rearing habitat, but will primarily need to occur in the migration corridor, and estuary habitat. The monitoring and research information collected in the next 10 years will provide an important opportunity to complete a more detailed evaluation of the status of the species and will provide additional knowledge to guide the next round of actions under this recovery plan. Because of this current lack of data, a surrogate population was used to estimate the current status of the Selway River steelhead population.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Introduction

This section of the recovery plan compares the Selway River steelhead population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and DPS. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT's Snake River steelhead status assessment (ICTRT 2008).

Population Status

The Population Status section describes the population's current status as defined in the ICTRT's most current status assessment (ICTRT 2008) where they discussed risk in terms of four viability parameters: Abundance, Productivity, Spatial Structure and Diversity. Other available information was also considered. The section focuses primarily on population Abundance (the total number of adults) and Productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure (the amount and nature of available habitat) and Diversity (genetic traits) concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the Snake River steelhead status assessment (ICTRT 2008).

Population Description: The Selway steelhead population includes the Selway River and all its tributaries (ICTRT 2003). The population consists of B-run steelhead returning to the Selway River drainage and likely has substantial population substructure. The Selway River steelhead population (Figure 5.2-5) is one of five populations within the Clearwater River MPG.

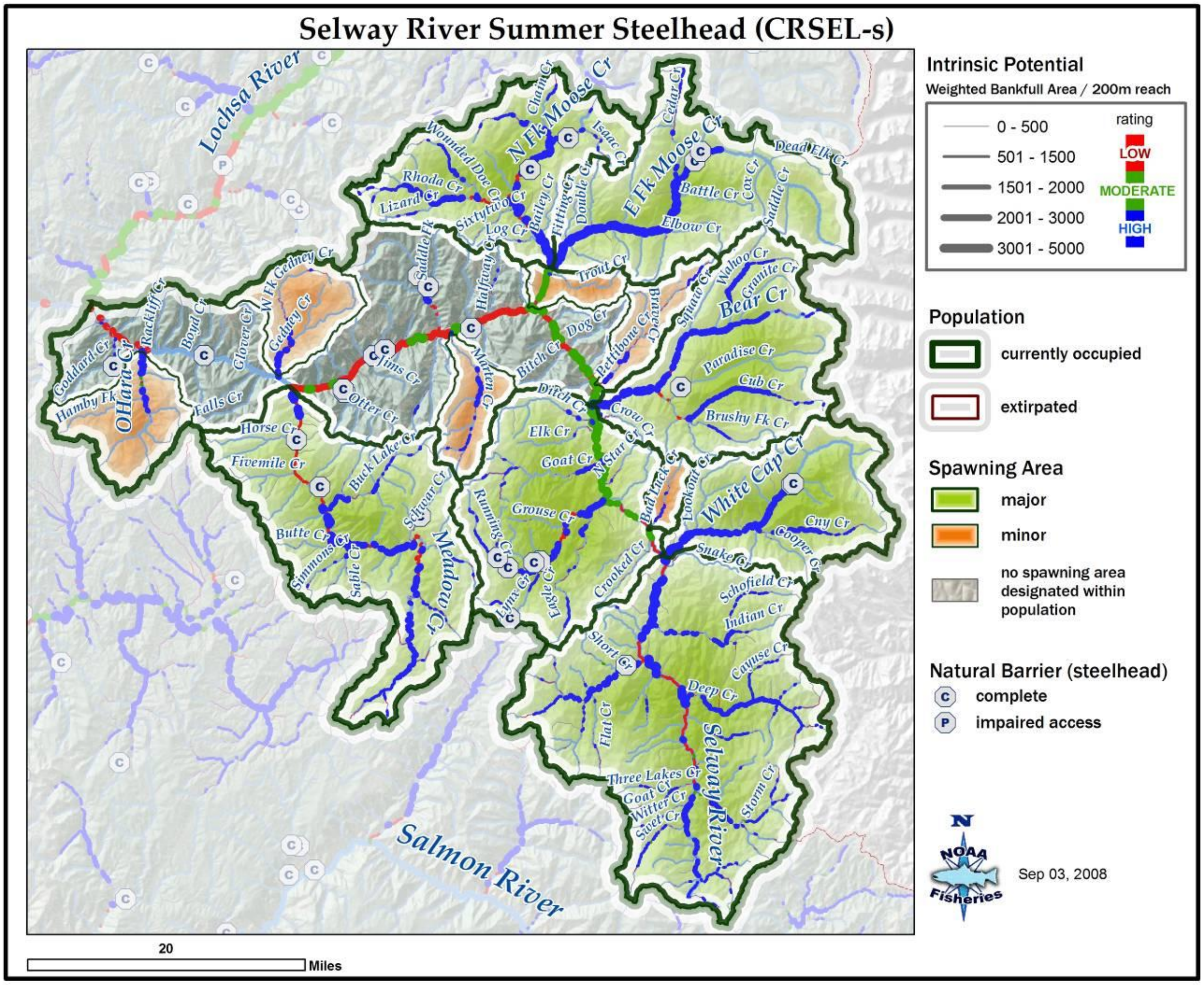


Figure 5.2-5. Selway River steelhead population boundary, with major and minor spawning areas.

The ICTRT classified the Selway River population as "intermediate" in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve viable status, with low (5% or less) risk of extinction over a 100-year timeframe.

Abundance and Productivity: The Idaho populations of Snake River steelhead do not have direct estimates of annual spawning escapements. Preliminary estimates were generated for an average population abundance and productivity for these populations using annual counts of wild steelhead passing Lower Granite Dam. Estimates were developed for two average surrogate populations to represent both major run types (A and B). These abundance and productivity estimates were then compared to a viability curve for an intermediate-sized Snake River steelhead population (requiring a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner).

The surrogate population for B-run steelhead above Lower Granite Dam has an estimated recent abundance of 345 and productivity of 1.09. It is rated at high risk based on current abundance and productivity, as shown in Figure 5.2-6. The point estimate representing current status lies just below the 25% risk curve for intermediate-sized Snake River steelhead populations, indicating a greater than 25% risk of extinction over a 100-year timeframe. More specific information about how the abundance and productivity estimates were calculated is included in the ICTRT's steelhead status assessment, Appendix B-1 *Calculating Representative Abundance and Productivity Estimates for Snake River A- and B-run Steelhead Populations*.

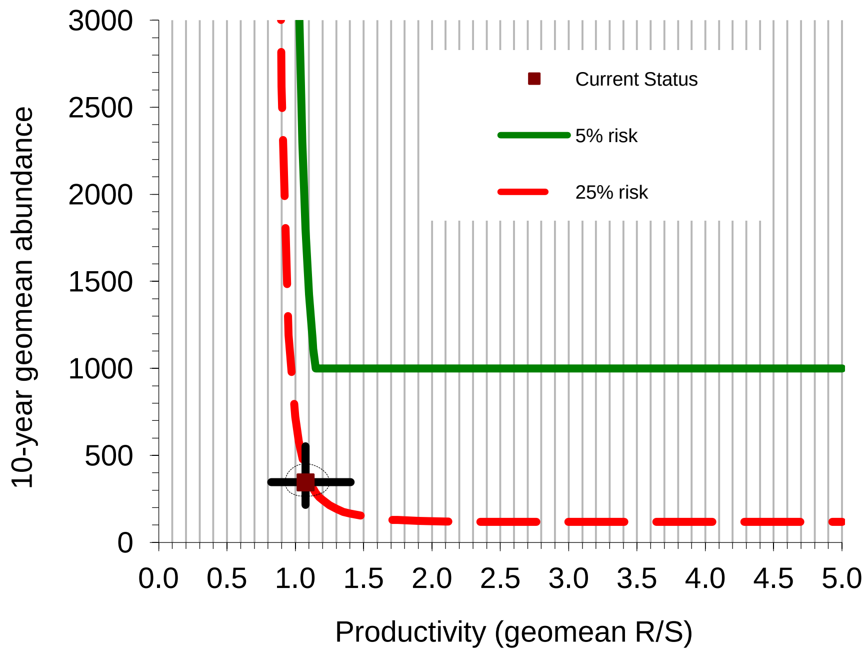


Figure 5.2-6. Snake River B-run surrogate steelhead population current estimated abundance and productivity (A/P) compared to DPS viability curve (1986-2005). Ellipse = 1 SE about the point estimate. Error bars = 90% CI for A, 98% CI for P.

Spatial Structure: The Selway population has extensive and complex branching of seven major spawning areas and six minor spawning areas, and this structure provides inherent protection against extinction. Based on a limited number of spawner surveys, current spawning appears to be distributed widely across the population and to occur in all major and minor spawning areas. The population's spatial structure score is therefore very low risk, which is the lowest possible score and is adequate for the population to attain its overall desired status of viable.

Diversity: For the Selway River, it is assumed that only B-run fish historically occupied the population, and that no major life history strategies have been lost. There is no hatchery program in the drainage, and genetic risk from hatchery fish is presumed to be low.

In common with all Snake River steelhead populations, the eight dams on the Columbia and Snake Rivers create a low level of diversity risk by selectively impacting migrating adults and juveniles. The dams establish a thermal barrier in the reservoirs behind the dams that delays and potentially induces some mortality of migrating adults early in the migration season. Changes in flow and temperature patterns associated with the dams likely inhibit juvenile out-migration in late spring, as temperatures rise and flows decrease, causing increased travel time, increased energy expenditure and greater physiological stresses. Despite these risks, the cumulative diversity risk for the Selway population is low, which is adequate for the population to achieve its desired status.

Summary: The Selway River steelhead population is currently at high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT's average surrogate B-run population passing Lower Granite Dam. In the absence of population-specific data, we assume that substantial improvements in abundance and productivity will need to occur for this population to reach its desired status of viable, which requires moving its abundance/productivity to low risk. The overall spatial structure and diversity rating is sufficiently low for this population to reach its desired status. Table 5.2-7 summarizes the population's abundance/productivity and spatial structure/ diversity risks. A complete version of the ICTRT's draft status assessment for Snake River Basin steelhead populations is available upon request from the National Marine Fisheries Service.

Table 5.2-7. Viable Salmonid Population parameter risk ratings for the Selway steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR
	High (>25%)	HR	HR Selway River	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the Selway River steelhead population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Section 5.1.1 summarizes regional-level factors that affect all Idaho Snake River steelhead populations.

Natal Habitat

Habitat Conditions: The Selway River steelhead population includes all tributaries draining into the Selway River. The population boundaries drain approximately 2,011 square miles. The Selway River is a designated Wild and Scenic River, and nearly all of the drainage is contained within the Selway-Bitterroot Wilderness Area. Elevations range from about 1,400 feet to almost 9,100 feet. There are about 2,339 km of stream within the Selway River drainage, with 61 percent (1,437 km) occurring downstream from natural barriers (Table 5.2-x). Annual precipitation is about 38 inches measured at the Fenn Ranger Station, with more snow accumulation at higher elevations (IDEQ 2000). Normal peak streamflows are associated with winter snowmelt and occur in the spring. Rain-on-snow events can melt accumulated snow causing rapid runoff and extreme flood flows. The combination of loose soils, steep slopes, and intense rain-on-snow precipitation events leads to relatively frequent landslides (IDEQ 2000).

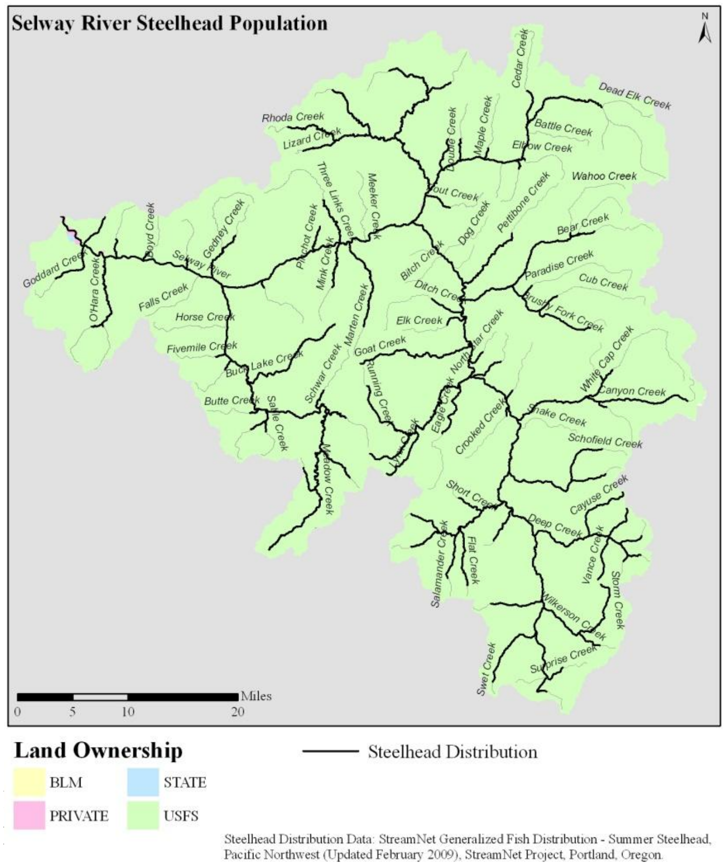


Figure 5.2-7. Steelhead distribution and land ownership in the Selway subbasin.

Steelhead are distributed throughout most streams of the population (Figure 5.2-7). The ICTRT identified seven major and six minor spawning areas (Figure 5.2-1). Almost 90 percent of the intrinsic potential steelhead habitat is contained within the seven major spawning areas. The Clearwater Subbasin Assessment rated the quality of steelhead habitat in the Selway mostly as good or excellent, particularly in the upper basin (Ecovista 2003, p 281).

Land ownership within the Selway River is primarily USFS (99.9%) with private (0.08%), and state lands (0.02%) making up the remaining 1% (Figure 7). Private and state lands are concentrated in the lower basin along the Selway River downstream from O'Hara Creek.

Because of the predominance of wilderness and roadless area in the Selway subbasin, human disturbance has been minimal. Natural sediment regimes may impact some fish species, and high stream gradients and other natural barriers are known to limit the distributions of multiple species.

IDEQ developed a list of impaired waters across the state of Idaho to comply with section 303(d) of the Clean Water Act. IDEQ's 2008 Integrated 303(d)/305(b) Report includes stream segments listed under section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA-approved TMDLs) (IDEQ 2009). Currently, no stream segments are listed as impaired (IDEQ 2009), reflecting the remote, relatively-undisturbed nature of the drainage.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for each population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds. It identified the limiting factors based on these reports, and on discussions with local fisheries experts and watershed groups.

Habitat in the Selway River population area is in relatively good shape with the exception of localized areas of excess sediment and a small number of potential migration barriers on tributaries. Table 5.2-8 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. The following section discusses each limiting factor.

Table 5.2-8. Habitat limiting factors identified for the Selway steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Reduce sediment from roads and recreation trails
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers

1. Excess sediment.

Fine sediment can harm steelhead and their habitat by smothering redds and spawning gravels, filling in pools used by juveniles for cover, or reducing the availability of aquatic insects (food). Excess fine sediments can reduce potential spawning habitat, incubation success, and juvenile rearing habitat quality. Conditions reported for the Selway River steelhead population suggest that sediment may be reducing population abundance and productivity.

The Clearwater River Subbasin Assessment identified sediment as one of the limiting factors for steelhead in the Selway River subbasin, mainly in the lower part of the basin (Ecovista et al. 2003, p. 346). Local experts convened for 2008 FCRPS biological opinion classified sediment as a limiting factor affecting steelhead in O'Hara Creek, Meadow Creek, and lower Selway mainstem (citation). The panel indicated that excess sediment was due to roads, timber harvest, and grazing in O'Hara Creek; roads in the lower Selway mainstem; and trails in Meadow Creek.

The Nez Perce National Forest also identified excess sediment as a risk to salmonid habitat in some subwatersheds of the Selway River (USFS 2007). Table 5.2-9 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for sediment to limit the abundance of different salmonid life stages (rearing, spawning, or both). Primary, and sometimes secondary, sources of excess sediment were identified for each subwatershed. In most subwatersheds, sediment ranked as a moderate or low risk to salmonid habitat, except for Lower East Fork Moose Creek, Upper Meadow Creek, and O'Hara Creek, for which sediment was ranked as a high risk to habitat. The high risk areas overlap with two steelhead major spawning areas (Meadow and East Fork Moose) and one minor spawning area (O'Hara) (see Figure 5.2-1). The primary sediment source identified was streamside roads although grazing was indicated in the Lower Meadow Creek subwatershed. Total road density was relatively low in most subwatersheds, except O'Hara Creek and Goddard Creek, which also have relatively high densities of roads in riparian areas. Roads are located in landslide-prone areas of some subwatersheds: Pinchot (3 miles), Lower Meadow (2 miles), Horse (1 mile), Glover (6 miles), Gedney (1 mile), Rackliff (1 mile), O'Hara (5 miles), and Goddard (5 miles). The Nez Perce National Forest recommends road decommissioning or maintenance for most of these subwatersheds (USFS 2007). A reduction in total road density, roads in riparian conservation areas, and amount of roads in landslide prone areas would be beneficial in both the O'Hara Creek and Goddard Creek subwatersheds. Road decommissioning, along with restoring riparian habitat along streams where road encroachment has occurred, would provide secondary benefits to stream temperature where increases in stream temperature have been noted on lower O'Hara Creek (USFS 2000).

Table 5.2-9. Subwatersheds identified in which excess sediment is a risk to salmonid habitat in the Selway River watershed (USFS 2007).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Primary Sources	Secondary Sources	Road Density (mi/mi^2)	
					Total	Within RCAs
Upper Running Creek	Rearing	2	Streamside Roads	Road Crossings	0.24	0.25
Lower Running Creek	Spawning	2	Streamside Roads	None	0.05	0.15
Elk Creek	Rearing	3	Streamside Roads	None	NA	0.00
Dog Creek	Spawning	3	Streamside Roads	None	NA	0.00
Lower Bear Creek	Spawning	2	Streamside Roads	None	NA	0.00
Lower East Fork Moose Creek	Rearing	1	Streamside Roads	None	NA	0.00
Meeker Creek	Spawning	2	Streamside Roads	None	NA	0.00
Pinchot Creek	Spawning	2	Streamside Roads	None	0.19	0.16
Upper Meadow Creek	Both	1	Streamside Roads	None	0.23	0.10
Lower Meadow Creek	Spawning	2	Grazing	None	0.24	0.32
Horse Creek	Spawning	2	Road Crossings	Streamside Roads	1.47	0.33
Glover Creek	Both	2	Road Crossings	Streamside Roads	1.15	1.38
Gedney Creek	Spawning	2	Streamside Roads	None	0.18	0.03
Rackliff Creek	Both	3	Road Crossing	None	0.54	1.55
O'Hara Creek	Both	1	Streamside Roads	Streamside Roads	1.82	1.13
Goddard Creek	Both	2	Streamside Roads	Streamside Roads	1.87	1.06

Stream segments in the Selway River that were 303(d)-listed as sediment-impaired in 1996 were later recommended for delisting by IDEQ and are now thought to support beneficial uses (IDEQ 2000). However, as described above, excess sediment remains a concern for salmonid habitat in some subwatersheds. Along with roads, the geology of the subbasin also contributes to high instream sediment levels, with many areas of high potential for surface erosion and mass failure.

2. Migration Barriers.

Migration barriers block habitat access for juveniles and migrating adults. Migration barriers can be formed by dams, culverts, irrigation withdrawals that create dry channels, stream temperature, or chemicals and toxicants. Most potential migration barriers in this population are due to culverts at road-stream crossings (USFS 2007). Additionally, the Selway River Falls at RM 17 acts as a migration barrier in low-flow years. Passage barriers were indicated as a minor limiting factor for Selway River steelhead in the Clearwater River Subbasin Assessment, based on the number of stream-road crossings in the drainage (Ecovista et al. 2003, p. 346, 353-4). Local experts convened for 2008 FCRPS noted migration barriers as affecting steelhead in the Lower Selway. Nez Perce National Forest subwatershed summaries identify four known fish migration barriers and six undetermined barriers, impairing access to at least 13 miles of salmonid habitat (Table 5.2-10). The barriers and miles of blocked stream habitat in Table 5.2-10 are for both resident and anadromous salmonids, and some barriers or estimated habitat miles may be upstream from potential steelhead habitat. Because the known migration barriers are on small tributaries, likely blocking access to a relatively small proportion of total habitat in the population, migration barriers are not a primary limiting factor. Further assessment of potential barriers blocking access to steelhead habitat would provide guidance on priorities for restoring connectivity within the population.

Table 5.2-10. Subwatersheds identified with known or undetermined barriers that may affect spawning or rearing habitat for steelhead in the Selway River subbasin (USFS 2007).

		Migration Barriers		Connectivity (miles)	
Watersheds (HUC5)	Subwatersheds (HUC6)	Migration Barriers	Not Determined	Impaired Access	Not Determined
Running Creek	Upper Running Creek	0	2	0	28
	Lower Running Creek	0	2	0	8
Meadow Creek	Upper Meadow Creek	0	1	0	1
Lower Selway River-Gedney Creek	Glover Creek	3	0	9	0
	Rackliff Creek	1	0	4	0
	O'Hara Creek	0	1	0	1
	Total:	**4**	**6**	**13**	**38**
Source: Nez Perce National Forest subwatershed summaries (USFS 2007).					

In summary, most salmonid habitat in this population is in good to excellent condition. Excess sediment from roads is a minor limiting factor in some streams. The extent that sediment has reduced steelhead habitat quantity or quality appears to be relatively small within the scope of the entire population. On the other hand, the prevalence of unstable soils and landslide prone areas necessitate careful consideration of future management policies within both the lower and upper portions of the subbasin.

Potential Habitat Limiting Factors and Threats: One potential concern has not yet risen to the level of a limiting factor, but needs to be managed to protect habitat access in the Selway watershed.

1. Potential passage barriers posed by undersized culverts - The road system in the Selway subbasin includes numerous culverts at stream crossings, many of which were not designed to accommodate 100-year storm events. If a culvert is too small to accommodate high flows during a storm event, the stream may overtop the road, delivering large amounts of sediment downstream and potentially creating a migration barrier.

Hatchery Programs

[To be developed]

Harvest Management
[To be developed]

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next ten years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholders.

Natal Habitat Recovery Strategy and Actions
Priority stream reaches: The Selway-Bitterroot Wilderness Area provides protection for much of the population. Restoration projects from stream reaches in the lower Selway should be prioritized in the steelhead major and minor spawning areas.

Habitat actions: The following habitat actions, ranked in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population.

1. Reduce sediment delivery to streams from roads by reducing total road densities, decommissioning roads within unstable areas and along streams, and replacing undersized culverts. The effort should also include adequate road maintenance and drainage improvements.

2. Eliminate migration barriers at road crossings that are blocking access to potential steelhead habitat.

Implementation of Habitat Actions
Most of the land in the Selway River subbasin is federal, so responsibility for implementation of the habitat portion of the recovery plan for this population lies within the jurisdictions of the USFS. The Nez Perce Tribe has also been active in implementing habitat improvement projects in this watershed. Because most of the habitat is within designated wilderness, there have been relatively few stream habitat restoration projects in the subbasin. The USFS (2000) noted road decommissioning and culvert replacements. Table 5.2-11 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Selway River steelhead population.

Habitat Cost Estimate for Recovery
The total cost of habitat recovery actions for the Selway River population over the next 10 years is estimated to be $382,000. Costs were estimated using the statement of work report from the Nez Perce Tribe for the Lolo Creek watershed restoration project. Cost for trail maintenance was estimated from other trail maintenance projects.

Hatchery Recovery Strategy and Actions
[to be added]

Harvest Recovery Strategy and Actions
[to be added]

Table 5.2-11. Recovery Actions Identified for the Selway River Steelhead Population.

Recovery Actions Identified for the Selway River Steelhead Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Lower Selway tributaries	Passage barriers	Culvert replacements	Glover Creek, 23-mile Creek, and Boyd Creek	3 @ $60,000 = $ 180,000		
O'Hara Creek	Lack of shade and LWD recruitment potential	Revegetation of riparian areas	3 miles of riparian plantings	3 @ $34,000 = $102,000		
Upper Selway	Sediment	Reduce sediment delivery from roads and trails	20 miles of trail improvements	20 miles @ $ 5,000/mile = $100,000		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**

5.2.6.3 Lochsa River Population

Abstract/Overview

The population is currently rated as not viable, with a high abundance/productivity risk. Its targeted desired status is Highly Viable, which requires a minimum of very low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its desired status.

Current Status	Desired Status
High Risk	Highly Viable

The actions identified in this recovery plan to occur over the next 10 years will likely move this population to maintained, but additional actions will be needed for the population to achieve its desired status. Additional improvements in survival may come from the spawning and rearing habitat, but will primarily need to occur in the migration corridor, and estuary habitat. The monitoring and research information collected in the next 10 years will provide an important opportunity to complete a more detailed evaluation of the status of the species and will provide additional knowledge to guide the next round of actions under this recovery plan.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and DPS. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT's Snake River steelhead status assessment (ICTRT 2008).

Population Status

The Population Status section describes the population's current status as defined in the ICTRT's most current status assessment (ICTRT 2008) where they discussed risk in terms of four viability parameters: Abundance, Productivity, Spatial Structure and Diversity. Other available information was also considered. The section focuses primarily on population Abundance (the total number of adults) and Productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure (the amount and nature of available habitat) and Diversity (genetic traits) concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the Snake River steelhead status assessment (ICTRT 2008).

Population Description: The Lochsa population includes the Lochsa River and all its tributaries (ICTRT 2003). The population was separated from Selway River steelhead largely on the basis of basin topography and assumed historic population size. The population consists of B-run returning adults. The Lochsa River steelhead population (Figure 5.2-8) is one of five populations within the Clearwater River MPG within the Snake River steelhead DPS.

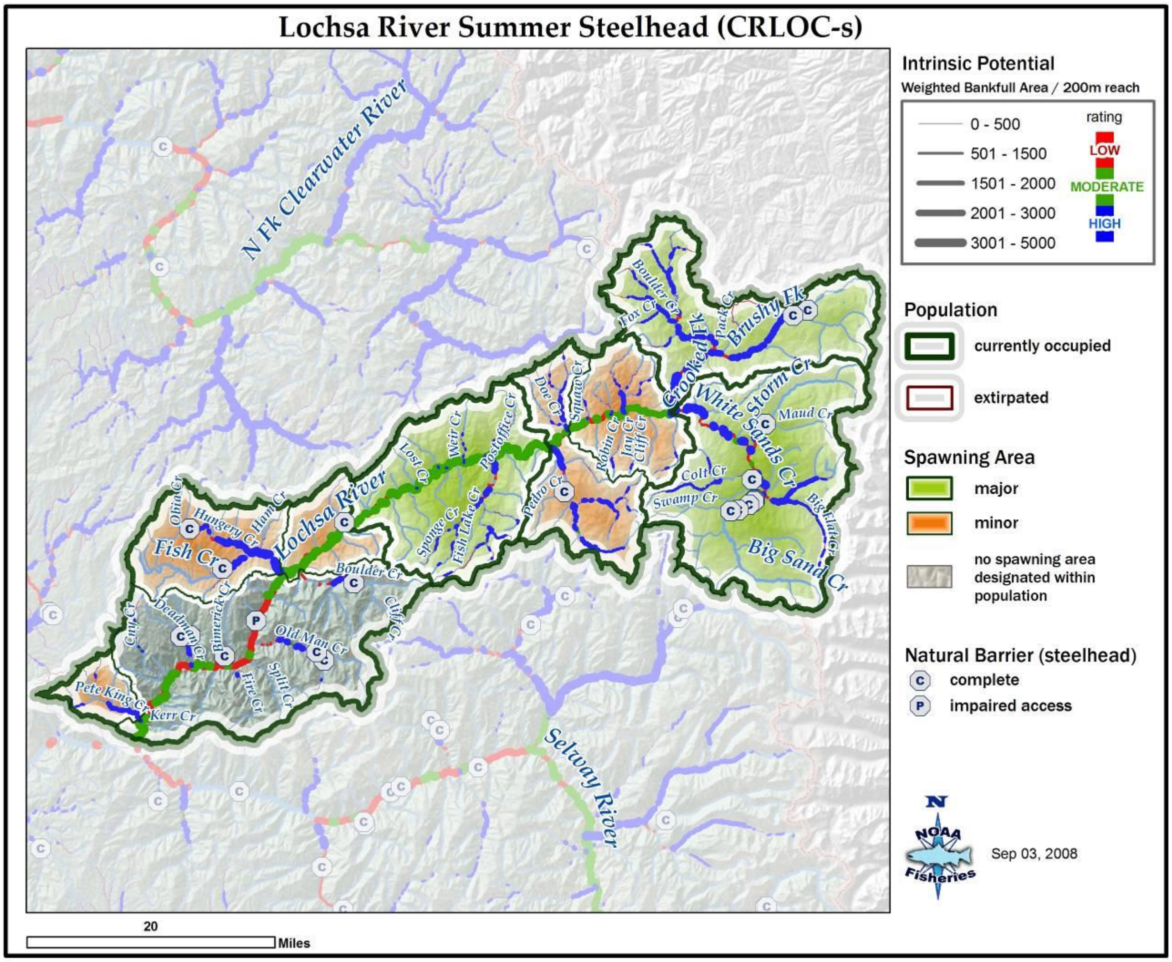


Figure 5.2-8. Lochsa River steelhead population boundary, with major and minor spawning areas.

The ICTRT classified the Lochsa River population as "intermediate" in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe. In order for the Lochsa River population to achieve a 1 percent or less risk ("very low risk") of extinction over 100 years, productivity would need to be at or greater than 1.29 recruits per spawner at the minimum abundance threshold.

Abundance and Productivity: The Idaho populations of Snake River steelhead do not have direct estimates of annual spawning escapements. Preliminary estimates were generated for an average population abundance and productivity for these populations using annual counts of wild steelhead passing Lower Granite Dam. Estimates were developed for two average surrogate populations to represent both major run types (A and B). These abundance and productivity estimates were then compared to a viability curve for an intermediate-sized Snake River steelhead population (requiring a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner).

The surrogate population for B-run steelhead above Lower Granite Dam has an estimated recent abundance of 345 and productivity of 1.09. It is rated at high risk based on current abundance and productivity, as shown in Figure 5.2-9. The point estimate representing current status lies just below the 25 percent risk curve for intermediate-sized Snake River steelhead populations, indicating a greater than 25 percent risk of extinction over a 100-year timeframe. More specific information about how the abundance and productivity estimates were calculated is included in the ICTRT's steelhead status assessment, Appendix B-1 *Calculating Representative Abundance and Productivity Estimates for Snake River A- and B-run Steelhead Populations*.

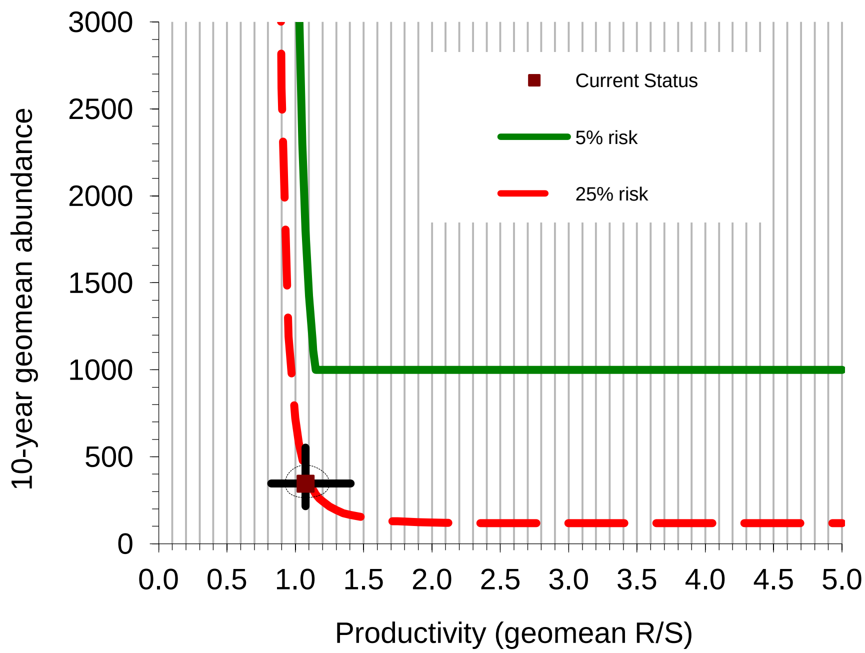


Figure 5.2-9. Snake River B-run surrogate steelhead population current estimated abundance and productivity (A/P) compared to DPS viability curve (1986-2005). Ellipse = 1 SE about the point estimate. Error bars = 90% CI for A, 98% CI for P.

Spatial Structure: The Lochsa population has three major spawning areas and five minor spawning areas, and this structure provides inherent protection against extinction. Based on a limited number of spawner surveys, current spawning appears to be distributed widely across the population and to occur in all major spawning areas. Although several migration barriers likely occur at road stream crossings in the population, these barriers block access to a relatively small amount of the population's total potential habitat. The population's spatial structure score is therefore very low risk. However, the IDFG redd distribution data examined by the ICTRT were not current and may not reflect the true current spawning distribution, creating some uncertainty for this score. A very low spatial structure risk is adequate for the population to attain its overall desired status.

Diversity: It is assumed that only B-run fish historically occupied the Lochsa River steelhead population, and that no major life history strategies have been lost. Currently there is no hatchery program in the drainage. However, from 1973 to 1982 hatchery steelhead fry were outplanted into several tributaries within the population in most years. Hatchery adults were released into the population in four different years, ending in 1990. All hatchery releases are presumed to have been Dworshak Hatchery B-run stock. Although hatchery releases have ended, there is a low genetic risk from the multiple generations of past releases and the potential for the natural spawning population to consist of some hatchery-origin fish.

The eight dams on the Columbia and Snake Rivers also affect population diversity. The dams create a low level of diversity risk by selectively impacting migrating adults and juveniles. Section 5.1.1 discusses this impact, which affects all Idaho Snake River steelhead populations.

Despite risks associated with past hatchery releases and the Columbia and Snake River hydrosystem, the cumulative diversity risk for the Lochsa population is low, which is adequate for the population to reach its desired status.

Summary: The Lochsa River steelhead population is currently at high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT’s average surrogate B-run population passing Lower Granite Dam. In the absence of population-specific data, we assume that substantial improvements in abundance and productivity will need to occur for this population to reach its desired status of highly viable, which requires a very low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for this population to reach its desired status. Table 5.2-12 summarizes the population’s abundance/productivity and spatial structure/ diversity risks. A complete version of the ICTRT’s draft status assessment for Snake River Basin steelhead populations is available upon request from the National Marine Fisheries Service.

Table 5.2-12. Viable Salmonid Population parameter risk ratings for the Lochsa steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	**HV**	**HV**	**V**	M
	Low (1-5%)	**V**	**V**	**V**	M
	Moderate (6 – 25%)	M	M	M	**HR**
	High (>25%)	**HR**	**HR** **Lochsa River**	**HR**	**HR**

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Section 5.1.1 summarizes regional-level factors that affect all Idaho Snake River steelhead populations.

Natal Habitat

Habitat Conditions: The Lochsa River steelhead population includes all tributaries of the Lochsa River. The population area drains approximately 1,181 square miles. The Lochsa River is a designated National Wild and Scenic River, and the headwaters of some of the south face tributaries are contained within the Selway-Bitterroot Wilderness Area. Elevations range from approximately 1,400 feet to almost 8,600 feet. Annual precipitation is about 40 inches, much of it snow accumulation at higher elevations. Rain-on-snow events can melt accumulated snow causing rapid runoff and extreme flood flows (IDEQ 1999). Normal peak streamflows are associated with winter snow melt and occur in the spring. There are about 1,368 km of stream within the Lochsa River steelhead population, with about 59 percent (809 km) occurring downstream from natural barriers. Streams draining into the Lochsa are often incised, creating narrow valleys with very steep valley walls. These streams often enter the river as steep gradient cascades and waterfalls. The combination of loose soils, steep slopes, and intense rain-on-snow precipitation events produces relatively frequent landslides (IDEQ 1999).

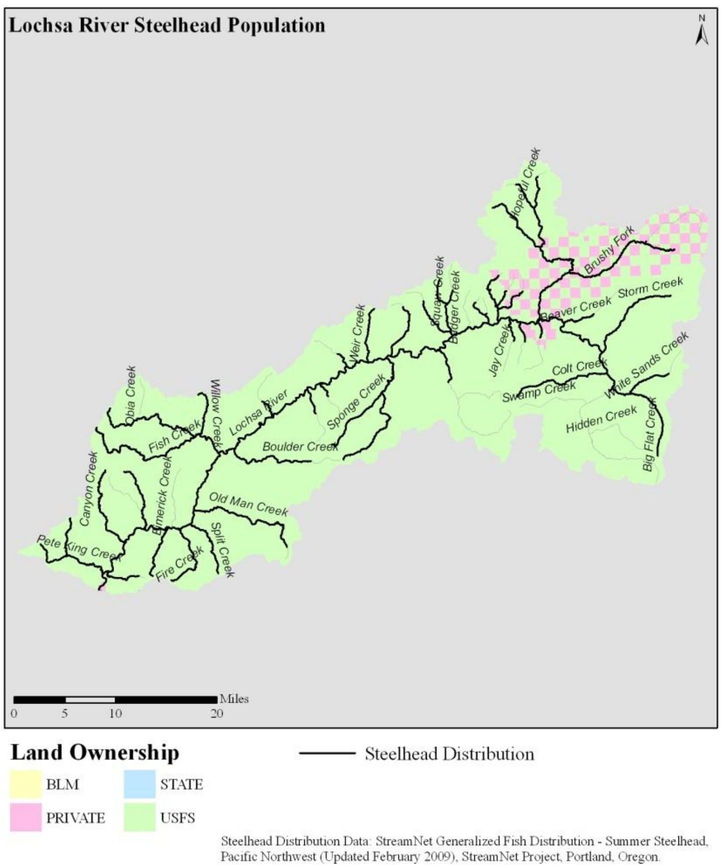


Figure 5.2-10. Land ownership in the Lochsa River steelhead population.

Steelhead are distributed throughout most streams of the population (Figure 5.2-10). The ICTRT identified three major (Crooked, Fish Lake, and White Sands) and five minor (Warm Springs, Fish, Lower Lochsa, Boulder Lochsa, and Pete King) spawning areas. Steelhead habitat quality is mostly good-to-excellent throughout the Lochsa River subbasin (Ecovista 2003, p. 281).

Land ownership within Lochsa River steelhead population is primarily public with the USFS managing 94.7 percent of the watershed. Private (5.2%), and state lands (<1%) make up the remaining 5.3 percent (Figure 5.2-4). Private lands are concentrated in a checker board configuration in the headwaters of the subbasin. Land use in the Lochsa River subbasin has included logging and associated roads, a small amount of livestock grazing, and recreation. Large-scale commercial logging on USFS lands started in the subbasin in 1953, leading to the construction of an extensive road network and to timber harvest in many riparian areas.

Landslides in the Lochsa River basin have had a large impact on stream habitat. In the winters of 1995 and 1996 there were 907 landslides caused by rain-on-snow events. Of these landslides, 58 percent were road-related, 12 percent were related to timber harvest, and the remaining 30 percent were considered to be natural slides (IDEQ 1999). The rain-on-snow flooding events dumped an estimated 272,000 tons of sediment into streams (Falter and Rabe 1997). The sediment volume delivered to streams was estimated to be 25 percent from roads, 4 percent from timber harvest areas, and 71 percent from natural landslides. Much of the impact to streams from the 1996-1997 storm events was thus likely due to natural conditions, with 20 percent of the Lochsa subbasin classified as landslide prone (IDEQ 2009). On the other hand, slope failures along the extensive road system contributed to over half of the landslides. Road failures remain a threat to stream habitat.

U.S. Highway 12, completed in 1962, parallels the Lochsa River, and connects Lewiston, Idaho, with Missoula, Montana. The highway can is a source of sediment from winter road sanding, maintenance construction, small landslides associated with cut and fill slopes, and intrusions into flood-prone areas of the river (IDEQ 1999).

IDEQ's 2008 Integrated 303(d)/305(b) Report includes stream segments listed under the Clean Water Act, section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA-approved TMDLs) (IDEQ 2009). The following table displays impaired streams segments for the Lochsa River steelhead population and the impairments that prevent each stream reach from attaining its beneficial uses (Table 5.2-13). Fourteen stream segments are listed as impaired in this population, all due to water temperature, for a total of 200 miles. No stream segments in this population were listed as impaired by non-pollutants (e.g. physical habitat alterations), and there are no TMDLs.

Table 5.2-13. Stream segments in the Lochsa River steelhead population identified from Sections 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Water body	Impairment/Cause	Stream Miles
Lochsa River - Deadman Creek to mouth	Water temperature	38.1
Lochsa River - Old Man Creek to Deadman Creek	Water temperature	6.94
Lochsa River - Fish Creek to Old Man Creek	Water temperature	6.93
Lochsa River - Indian Grave Creek to Fish Creek	Water temperature	19.65
Lochsa River- Warm Springs Creek to Indian Grave Creek	Water temperature	11.96
Lochsa River - confluence of Crooked Fork, White Sand Creek	Water temperature	13.11
Boulder Creek - source to mouth	Water temperature	45.19
Storm Creek - source to mouth	Water temperature	4.81
Fish Creek - Hungery Creek to mouth	Water temperature	4.71
Fish Creek - source to Hungery Creek	Water temperature	8.41
Deadman Creek - source to East Fork Deadman Creek	Water temperature	8.67
Canyon Creek - source to mouth	Water temperature	0.63
Pete King Creek - Walde Creek to mouth	Water temperature	18.22
Walde Creek - source to mouth	Water temperature	12.46
14 Water Bodies	**All Water Temperature**	**199.79**

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions and through conversations with local experts. We conclude that the habitat limiting factors for the Lochsa River steelhead population are migration barriers, excess sediment, riparian conditions, habitat complexity, and elevated stream temperatures. Table 5.2-14 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. A discussion of each limiting factors for habitat follows. Information of habitat conditions was provided by the USFS, IDEQ, the Clearwater Subbasin Assessment and Management Plan, and a panel of local experts convened for the 2008 FCRPS biological opinion (USFS 2007, IDEQ 1999, Ecovista 2003, FCRPS 2009).

Table 5.2-14. Primary limiting factors identified for the Lochsa steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Reduce chronic sediment delivery from roads
Riparian Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Revegetation of riparian areas
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Revegetation of riparian areas to increase LWD recruitment over time
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Regrowth of riparian vegetation to improve shade and stream cover to reduce stream temperature

1. Migration Barriers.

Loss of habitat connectivity has been ranked as having a moderate influence on steelhead in the Lochsa River subbasin, with most barriers created by culverts at stream road crossings (Ecovista et al. 2003, p. 346). The greatest number of stream road crossings is in the Crooked and Upper Lochsa subwatersheds in the upper Lochsa subbasin (Ecovista et al. 2003). In subwatershed summaries for the Lochsa River, the Clearwater National Forest indicated 17 known fish migration barriers, blocking access to 17 miles of salmonid habitat, and 50 undetermined barriers, potentially blocking access to 36 additional miles of salmonid habitat (Table 5.2-15). Additional barriers may also exist on private lands. Road crossings are the primary cause of known and potential migration barriers (USFS 2007). The barriers and miles of blocked stream habitat in Table 3 are for both resident and anadromous salmonids, and some barriers or estimated habitat miles may be upstream from potential steelhead habitat.

Table 5.2-15. Subwatersheds identified with known or possible barriers to fish migration in the Lochsa River subbasin (USFS 2007).

		Migration Barriers		Connectivity (miles)	
Watersheds (5th-field HUCs)	Subwatersheds (6th-field HUCs)	Migration Barriers	Not Determined	Impaired Access	Not Determined
Crooked Fork Creek Watershed	Upper Crooked Fork Creek	0	1	0	0
	Lower Crooked Fork Creek	5	2	2	0
	Lower Brushy Fork Creek	0	2	0	5
Colt Killed Creek Watershed	Lower Colt Killed	0	2	0	0
	Lower Big Sand	0	8	0	14
Upper Lochsa River Watershed	Legendary Bear Creek	0	1	0	0
	Wendover Creek	0	13	0	1
Middle Lochsa River	Weir Creek	4	1	6	1
	Stanley Creek	1	3	1	2
Lower Lochsa	Bimerick Creek	0	1	0	7
	Dead Man Creek	0	1	0	0
	Glade Creek	3	5	7	0
	Canyon Creek	0	6	0	3
	Pete King Creek	4	4	1	3
	Total:	**17**	**50**	**17**	**36**

2. Excess Sediment.

Conditions reported for the Lochsa River suggest that sediment may be reducing population abundance and productivity. In the upper Lochsa River subbasin, nearly half of a group of sites evaluated by the Clearwater National Forest exceeded the Forest Plan salmonid habitat standard of less than 35 percent cobble embeddedness (USFS 2004).

Sediment was indicated as one of the limiting factors for steelhead in the Lochsa River in the Clearwater River Subbasin Assessment and Management Plan, with sediment constraining an estimated 73.7 miles of steelhead spawning and rearing habitat (Ecovista et al. 2003, p. 353). The Clearwater National Forest has also identified excess sediment as a risk to salmonids in some subwatersheds of the Lochsa River (USFS 2007). Table 5.2-16 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for sediment to limit the abundance of different salmonid life stages (rearing, spawning, or both). Excess sediment was indicated as either a high or moderate threat to salmonid habitat in many subswatersheds, including the steelhead major spawning areas Crooked Fork and White Sands, and minor spawning areas Pete King and Lower Lochsa. Streamside roads were identified as the primary source of human-caused excess sediment. Total road density and road density within riparian conservation areas (RCAs) were high in many of the subwatersheds.

Table 5.2-16. Subwatersheds in the Lochsa River where sediment is a risk to steelhead abundance/productivity (USFS 2007). Primary sources of excess sediment are shown for different life stages (rearing, spawning, or both).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Primary Sources	Road Density (mi/mi²)	
				Total	Within RCA
Pete King Creek	Both	1	Streamside Roads	5.5	4.58
Lower Crooked Fork Creek	Spawning	1	Streamside Roads	6.3	3.10
Spruce Creek	Spawning	2	Streamside Roads	1.8	1.60
Lower Brushy Fork Creek	Spawning	1	Streamside Roads	5.41	3.53
	Rearing	2	Streamside Roads		
Lower Colt Killed Creek	Both	2	Streamside Roads	2.62	1.00
Legendary Bear Creek	Spawning	2	Streamside Roads	4.37	3.23
Wendover Creek	Spawning	2	Streamside Roads	4.07	3.06
Fishing Creek	Spawning	1	Streamside Roads	3.09	2.74
Deadman Creek	Both	2	Streamside Roads	1.84	0.36
Glade Creek	Both	2	Streamside Roads	1.54	0.56
Canyon Creek	Both	2	Streamside Roads	5.71	4.13

Although the road system is likely contributing excess sediment to streams in the Lochsa River, sediment levels may also be naturally high. The geology of the subbasin contributes to high instream sediment levels: within the Lochsa subbasin, 81 percent of watersheds have high surface erosion potential, 85 percent have high mass wasting potential, and 93 percent of the total landslide prone area is within 150 feet of a stream (IDEQ 1999). The extensive road network has likely exacerbated naturally high levels of sediment delivery to streams. The forest road system in the Lochsa subbasin includes numerous culverts at stream crossings, many of which may be undersized. If a culvert is too small to accommodate high flows, the stream may overtop the road, delivering large amounts of sediment downstream and potentially decreasing substrate suitability or creating a migration barrier.

3. Degraded Riparian Conditions.

Degraded riparian areas impact water quality, ecosystem function, and the stream environment (Murphy and Meehan 1991, Naiman et al. 1992). Riparian areas influence stream conditions by stabilizing streambanks with vegetative root systems, reducing erosion and sedimentation; by providing canopy or overhead vegetation that creates shade to reduce stream temperature; and by providing a source of large woody debris important to instream habitat complexity and pool formation (Naiman et al. 1998). Thus, poor riparian conditions can threaten salmonids by impacting sediment, stream temperature, and habitat complexity. Conditions reported for Lochsa River steelhead suggest that degraded riparian conditions are reducing population abundance and productivity.

Disturbance of riparian habitat ranked as a moderate limiting factor for Lochsa River steelhead in the Clearwater River Subbasin Assessment and Management Plan (Ecovista 2003). Streamside roads, timber harvest, and wildfire have contributed to degraded riparian conditions. Legacy grazing practices in the lower elevation areas of the subbasin degraded riparian vegetation in meadow areas.

4. Loss of Habitat Complexity.

Habitat indicators such as pool frequency, pool quality, abundance of large woody debris, channel morphology, substrate, and streambank condition are often used to describe habitat complexity and quality (NMFS 1996). Poor habitat quality affects abundance and productivity VSP parameters by reducing survival and carrying capacity. Altered stream channels often lack the habitats (pools and riffles) and cover components (LWD, overhanging vegetations, undercut banks) necessary to fulfill salmonid habitat requirements during different life stages. Low abundance of LWD can lead to loss of pool habitat and hydraulic complexity as well as reduced cover and protection from peak flows (Hick et al. 1991). The quality and complexity of habitat in the Lochsa River steelhead population have been reduced by channel modification and loss of instream woody debris and LWD recruitment potential.

Lack of high quality pools and poor instream cover were ranked as moderate limiting factors for Lochsa River steelhead in the Clearwater River Subbasin Assessment and Management Plan (Ecovista 2003). The Clearwater National Forest identified channel modification and lack of LWD and LWD recruitment potential as risks to salmonids in the lower Lochsa River subbasin (USFS 2007). Table 5.2-17 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for channel modification or lack of LWD to limit the abundance of different salmonid life stages (rearing or spawning). In the lower Lochsa River basin, stream channel modifications and lack of LWD were ranked as minor risks to spawning and rearing in the Fish Creek minor spawning area (Upper Fish, Lower Fish, and Hungery subwatersheds) and in Fire Creek, which is outside the minor or major spawning areas. Streamside roads were identified as the primary cause of channel modifications and lack of LWD and LWD recruitment potential. In the upper Lochsa River basin, lack of LWD ranked as a moderate to high risk to rearing habitat in several subwatersheds. These subwatersheds lie within the minor and major spawning areas of Warm Springs, Lower Lochsa, and Crooked Fork. Streamside roads and timber harvest were identified as the primary causes of LWD reductions in the upper basin. In a separate report, the USFS noted that pool quality in the Crooked Fork Creek drainage was poor to fair, likely due to the lack of LWD (USFS 2004).

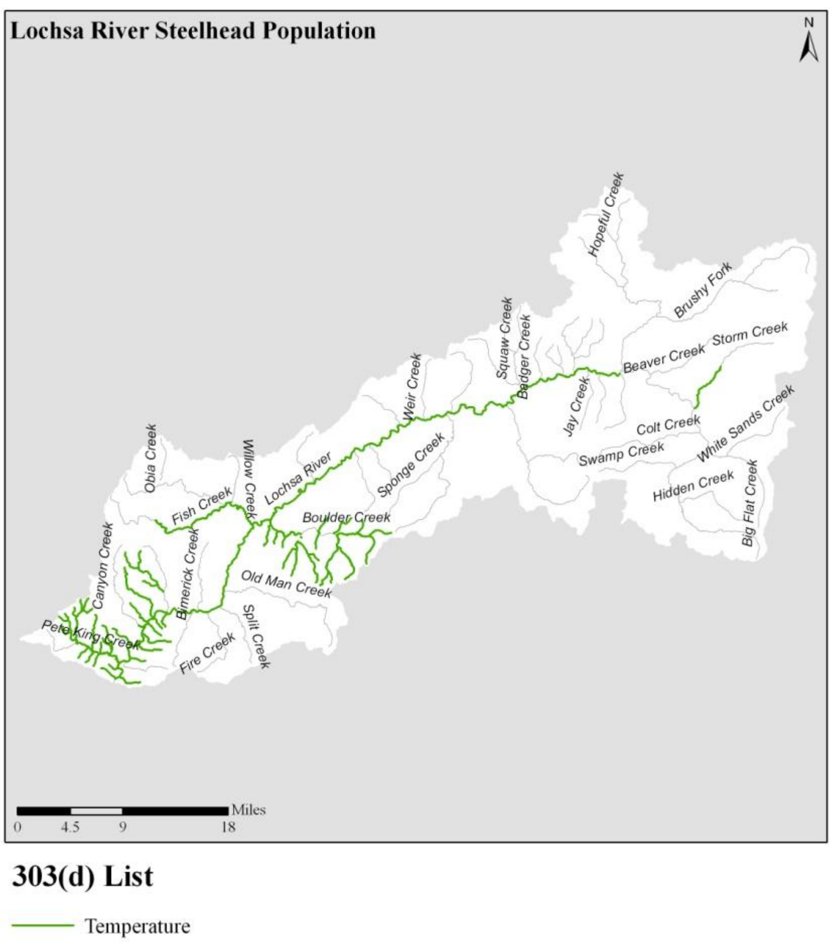
Consistent with the USFS assessments shown in Table 5.2-17, an expert panel of local biologists convened for the 2008 FCRPS biological opinion identified lack of woody debris as a habitat limiting factors for steelhead in the upper Lochsa, but not the lower Lochsa (citation). The panel noted that loss of riparian vegetation, leading to reductions in LWD recruitment, existed throughout much of the area.

Table 5.2-17. Subwatersheds in the Lochsa River population in which degraded habitat quality is a risk to salmonid abundance and production (USFS 2007). Primary sources of habitat degradation were identified for different life stages (rearing, spawning, or both).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Risk/Threat	Primary Sources	Secondary Sources
Upper Fish Creek	Spawning	3	Channel Modification	Streamside roads	None
	Rearing	3	Woody Debris	Streamside roads	None
Hungery Creek	Spawning	3	Channel Modification	Streamside roads	None
	Rearing	3	Woody Debris	Streamside roads	None
Lower Fish Creek	Spawning	3	Channel Modification	Streamside roads	None
	Rearing	3	Woody Debris	Streamside roads	None
Fire Creek	Spawning	3	Woody Debris	Streamside roads	None
	Rearing	3	Woody Debris	Streamside roads	None
Lower Crooked Fork Creek	Rearing	1	Woody Debris	Timber Harvest	None
Spruce Creek	Rearing	2	Woody Debris	Timber Harvest	None
Legendary Bear Creek (Papoose Cr)	Rearing	1	Woody Debris	Streamside roads	None
Wendover Creek	Rearing	2	Woody Debris	Streamside roads	None
Fishing Creek	Rearing	1	Woody Debris	Streamside roads	None

5. Elevated Water Temperature.

Elevated water temperatures may adversely affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions (Spence et al. 1996). In the Clearwater River Subbasin Assessment and Management Plan, stream temperature was indicated as one of the limiting factors for steelhead in the Lochsa River (Ecovista et al. 2003, p. 346). IDEQ currently lists about 200 miles of stream on the 303(d) list as impaired by high temperatures (Table 1, Figure 5.2-11). These stream reaches include most of the mainstem Lochsa River and some tributaries in the lower part of the drainage. Cold water aquatic life criteria of maximum daily temperature of 19°C average or 22°C instantaneous were exceeded for these streams. IDEQ (1999) has suggested that elevated stream temperatures above cold water aquatic life criteria are natural and regular occurrences in the mainstem Lochsa River, due to the area's hot summers. However, legacy clear cutting in the upper Lochsa River basin, timber-harvest related roads, and Highway 12 along a large portion of the Lochsa have likely reduced stream shade from natural conditions. Many roads occur along stream bottoms, depleting streamside vegetation.



Data: Idaho Department of Environmental Quality. Idaho 2008 305(b)/303(d) Integrated Report (Final).

Figure 5.2-11. Stream segments in the Lochsa River steelhead population identified from Sections 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

In summary, habitat limiting factors in the Lochsa River steelhead population are primarily linked to the extensive road system, which has led to migration barriers, elevated sediment, reduced habitat complexity, degraded riparian conditions, and possibly elevated stream temperatures. Although habitat in many stream reaches in the Lochsa population is in relatively good shape, these habitat limiting factors are nonetheless likely reducing abundance and productivity for this population.

Potential Habitat Limiting Factors and Threats: One potential concern has not yet risen to the level of a limiting factor, but needs to be managed to protect habitat access in the Lochsa watershed.

1. Reduced water quality due to fuel spills — Since U.S. Highway 12 is the shortest route between Lewiston, Idaho and Missoula, Montana, the highway experiences a high volume of passenger vehicle and large truck traffic. The highway is a very winding road and it is closely situated along the Lochsa. Several notable fuel spills have occurred within the last decade, with diesel fuel spills up to 6,300 gallons going into the Lochsa River. Also, there have recently been a series of over-sized shipments on U.S. Highway 12 that may result in additional accidents along the Lochsa River.

Hatchery Programs
[To be developed]

Harvest Management
[To be developed]

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next ten years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

Priority stream reaches: First priority stream reaches for habitat restoration are those with intrinsic potential steelhead habitat in the in major spawning areas Crooked Fork, Fish Lake, and White Sands (see Figure 5.2-8). These watersheds contain almost two-thirds of the intrinsic potential habitat for the population. The second tier of priority stream reaches are those with potential for steelhead in the population's minor spawning areas: Warm Springs, Pete King, Lower Lochsa, Boulder, and Fish.

No specific habitat restoration efforts are needed in the Lochsa River mainstem, which provides important spawning, rearing, and migration habitat for the population. Habitat potential in the Lochsa River mainstem is overwhelmingly influenced by natural geomorphic features and stream power. Sediment reduction in the tributaries is the most important potential restoration action for habitat in the mainstem. U.S. Highway 12 runs along much of the Lochsa mainstem, precluding restoration of natural riparian conditions along one side of the river.

Habitat actions: Habitat in relatively good condition should continue to be protected, primarily by the USFS. Stream habitat in many parts of the population, however, will require recovery actions. The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed.

1. Eliminate known fish migration barriers blocking steelhead access to potential habitat, mainly at road stream-crossings. Inventory road crossings throughout the population to identify additional steelhead migration barriers.
2. Mitigate chronic sediment sources from roads. Controlling sources of sediment from roads may require road realignment, closure, or obliteration, or erosion control measures at stream crossings. Decommissioning of streamside roads will also lead to improved riparian conditions and increased LWD recruitment potential over time.
3. Improve riparian conditions where they have been altered by management activities in order to reduce sediment delivery to streams, increase shade, and increase large wood recruitment to streams over the long term.

Implementation of Habitat Actions

Because 95 percent of the land in the Lochsa River subbasin is managed by the Clearwater National Forest, responsibility for implementation of much of the habitat portion of the recovery plan for this population lies within the jurisdiction of the USFS. Habitat restoration actions may be necessary, however, on both public and private land. The Nez Perce Tribe has been active in implementing habitat improvement projects throughout the watershed. Table 5.2-18 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Lochsa River steelhead.

Habitat Cost Estimate for Recovery

The total cost of habitat recovery actions for the South Fork Clearwater population over the next 10 years is estimated to be $ 933,000. The cost are based on cost estimates from the Middle Lochsa restoration plan.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 5.2-18. Recovery Actions Identified for the Lochsa Steelhead Population.

Recovery Actions Identified for the Lochsa Steelhead Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Badger and Wendover Crks	Migration barriers	Culvert replacement or removal	1 culvert replacement	$60,000		
	Riparian conditions	Riparian rehabilitation				
	Sediment	Road decommissioning, culvert removal/replacement, noxious weed control	6 miles of riparian road improvement,	6 @ $15,000 = $90,000		
Crooked Fork	Sediment	Road decommissioning, possible land acquisition	25.2 miles of road decommissioning,	25.2 @ $15,000 = $378,000		
	Riparian conditions	Revegetation of riparian areas	40 acres revegetation of riparian areas and disturbed areas	40 @ $1,000 = $40,000		
Legendary Bear (Papoose Crk)	Migration barriers	Culvert replacement or removal	2 culvert removals	2 @ $60,000 = $120,000		
	Sediment	Road decommissioning, culvert removal/replacement, mine reclamation	3 miles of roads decommissioned	3 @ $15,000 = $45,000		
Lower Lochsa (Fish Crk to Pete King Crk)	Migration barriers	Replacement or removal of culverts and other barriers	2 culvert replacements, removal of sediment traps along 2 stream miles	2 @ $60,000 = $120,000		
	Riparian conditions	Riparian revegetation	80 acres riparian revegetation	80 @ $1,000 = $80,000		
	Sediment	Road decommissioning, culvert removal or replacement,	41 miles of road decommissioning, and 1.9 miles of road improvements	43 @ 15,000 = $645,000		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**

5.2.6.4 Lolo Creek Steelhead Population

Abstract/Overview

The Lolo Creek steelhead population is currently rated as not viable, with a high abundance/productivity risk. Its targeted desired status is Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Maintained

The actions identified in this recovery plan to occur over the next 10 years will likely move this population to its desired status. The monitoring and research information collected in the next 10 years will provide an important opportunity to complete a more detailed evaluation of the status of the species and will provide additional knowledge to guide the next round of actions under this recovery plan.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and DPS. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT's Snake River steelhead status assessment (ICTRT 2008).

Population Status

The Population Status section describes the population's current status as defined in the ICTRT's most current status assessment (ICTRT 2008) where they discussed risk in terms of four viability parameters: Abundance, Productivity, Spatial Structure and Diversity. Other available information was also considered. The section focuses primarily on population Abundance (the total number of adults) and Productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure (the amount and nature of available habitat) and Diversity (genetic traits) concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the Snake River steelhead status assessment (ICTRT 2008).

Population Description: Lolo Creek was identified as an independent population based on its basin size and its geographic isolation from all but the Lower Mainstem steelhead population, which supports A-run fish, whereas Lolo Creek currently supports A-run and B-run steelhead (Figure 5.2-12). It is unknown whether the Lolo Creek population historically supported both A-run and B-run steelhead (ICTRT 2003).

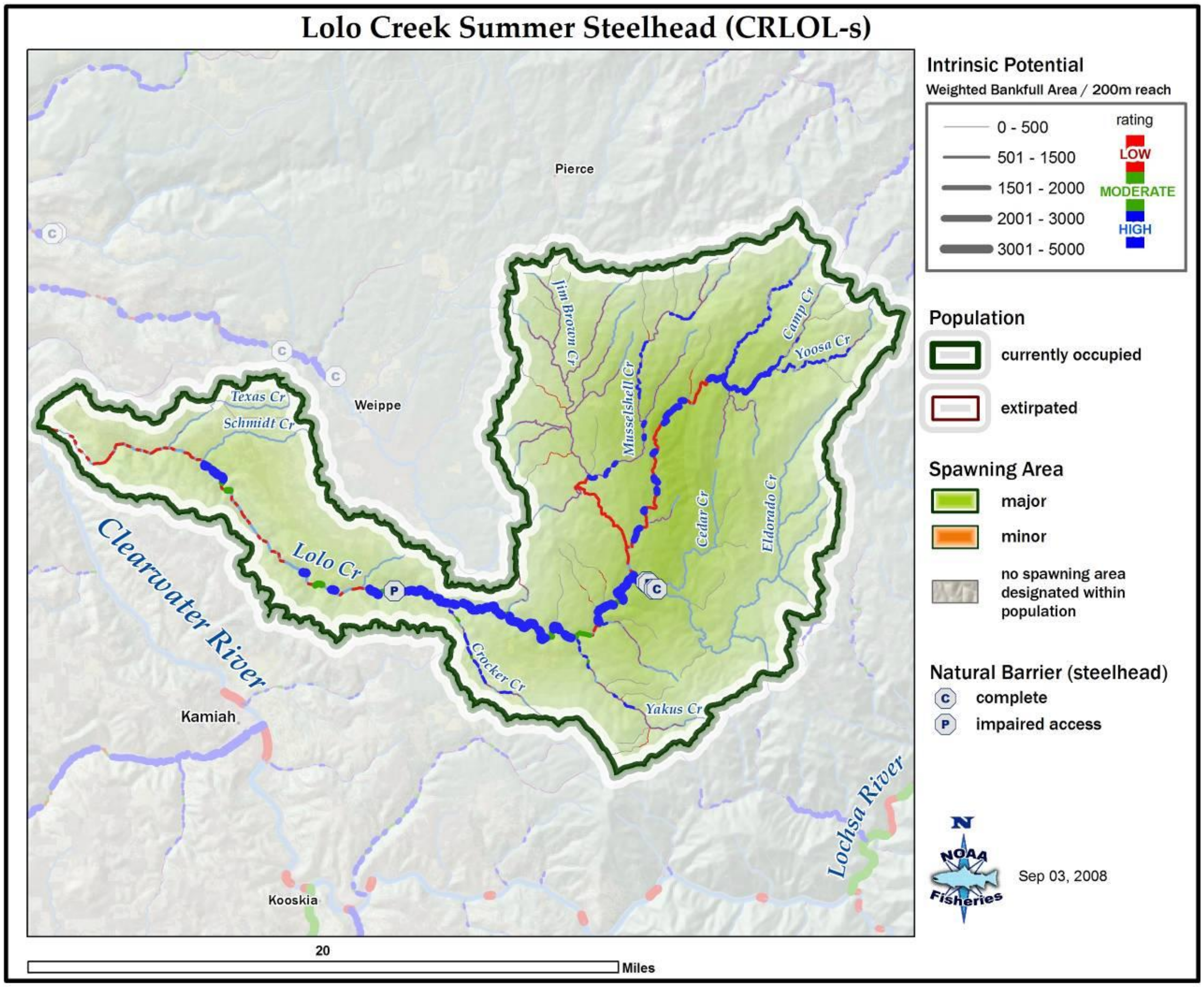


Figure 5.2-12. Lolo Creek steelhead population, consisting of one major spawning area. (The barrier on Eldorado Creek is a likely only a partial barrier to steelhead migration, and not a complete barrier are shown here.)

The Lolo Creek drainage currently produces very few steelhead due to low numbers of returning adults and habitat conditions. Spawning has been observed in the upper mainstem of Lolo Creek, but the overall number of redds observed has been relatively low. Very little spawning has been observed in the Musselshell and Jim Brown Creek drainage, presumably due to fine textured substrates in the alluvial meadow systems of that drainage. Although steelhead habitat is available in the Eldorado Creek drainage, natural-returning steelhead have only been observed a few times. The Eldorado Falls may still present a partial migration barrier during various streams flows.

The ICTRT classified the Lolo Creek population as “basic” in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe.

Abundance and Productivity: The Idaho populations of Snake River steelhead do not have direct estimates of annual spawning escapements. Preliminary estimates were generated for an average population abundance and productivity for these populations using annual counts of wild steelhead passing Lower Granite Dam. Estimates were developed for two average surrogate populations to represent both major run types (A and B). These abundance and productivity estimates were then compared to a viability curve for an intermediate-sized Snake River steelhead population (requiring a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner).

The Lolo Creek population includes spawning and rearing habitats at two relatively distinct elevation levels and is believed by IDFG to support both A- and B-run components. In the absence of population-specific data, the abundance and productivity estimates presented here are for the B-run surrogate population because B-run Snake River steelhead appear to be at higher risk of extinction than A-run steelhead. The surrogate population for B-run steelhead above Lower Granite Dam has an estimated recent abundance of 345 and productivity of 1.09. It is rated as high risk based on current abundance and productivity, as shown in Figure 5.2--13. The point estimate representing current status lies just below the 25 percent risk curve for intermediate-sized Snake River steelhead populations, indicating a greater than 25 percent risk of extinction over a 100-year timeframe. More specific information about how the abundance and productivity estimates were calculated is included in the ICTRT's steelhead status assessment, Appendix B-1 *Calculating Representative Abundance and Productivity Estimates for Snake River A- and B-run Steelhead Populations*.

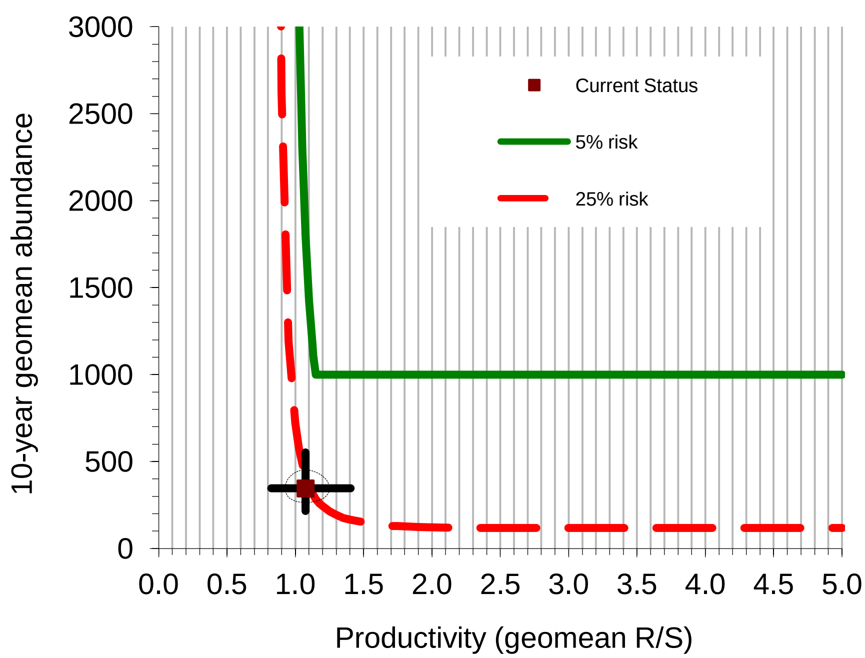


Figure 5.2-13. Snake River B-run surrogate steelhead population current estimated abundance and productivity (A/P) compared to DPS viability curve (1986-2005). Ellipse = 1 SE about the point estimate. Error bars = 90% CI for A, 98% CI for P.

The Clearwater National Forest has monitored juvenile steelhead density in 15 transect reaches on Lolo Creek from 1998 to 2008. Steelhead densities at these monitoring sites declined steeply between 1988 and 1996, and since 1996, steelhead densities have remained low (CNF 2008, p.28). Based on the surrogate B-run population and on low juvenile densities at survey sites, this population appears to be at high risk of extinction in terms of abundance and productivity. Abundance will need to increase for this population to reach its desired status.

Spatial Structure: The Lolo population consists of just one major spawning area, which potentially creates an inherent extinction risk. However, this risk is mitigated by the fairly extensive branching provided by the tributaries to Lolo Creek and the relatively large amount of intrinsic potential habitat within the watershed. Based on a limited number of spawner surveys, spawning appears to be occurring throughout Lolo Creek and in the tributaries Yakus, Eldorado, Yoosa, Hemlock and Musselshell Creeks. However, the IDFG redd distribution data examined by the ICTRT were not current and may not reflect the true current spawning distribution. The population's cumulative spatial structure score is low risk (as opposed to very low risk) largely due to the uncertainty about current spawning distribution. A low spatial structure risk is adequate for the population to attain its overall desired status.

Diversity: Diversity risk for the Lolo Creek population is driven by the lack of genetic data and the long history of hatchery outplanting in the watershed. Because no genetic data were available for this population, the ICTRT rated the genetic variation metric for this population as moderate. Hatchery outplants have led to a more substantial diversity risk for the population. Steelhead fry, fingerlings, smolts and adults have been released into the population since 1977, with all releases from Dworshak Hatchery B-run stock. Out-of-MPG hatchery steelhead are thus deliberately released into the population under current management programs, to supplement the watershed's natural population. This practice has created a high diversity risk for spawner composition because of the duration of the supplementation releases over several generations of steelhead. The naturally spawning population may consist of a high proportion of hatchery-origin fish. The cumulative diversity risk for this population is moderate, which is sufficiently low for the population to meet its overall desired status.

Summary: The Lolo Creek steelhead population is currently at high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT's average surrogate B-run population passing Lower Granite Dam. In the absence of population-specific data, we assume that improvements in abundance and productivity will need to occur for this population to reach its desired status of maintained, with moderate risk. The overall spatial structure and diversity rating of moderate is sufficiently low for this population to reach its desired status. Table 5.2-19 summarizes the population's abundance/productivity and spatial structure/diversity risks. A complete version of the ICTRT's draft status assessment for Snake River Basin steelhead populations is available upon request from the National Marine Fisheries Service.

Table 5.2-19. Viable Salmonid Population parameter risk ratings for the Lolo steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR
	High (>25%)	HR	HR	HR Lolo Creek	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Section 5.1.1 summarizes regional-level factors that affect all Idaho Snake River steelhead populations.

Natal Habitat

Habitat Conditions: The Lolo Creek steelhead population includes Lolo Creek and all of its tributaries. The population geographic boundary drains about 242 square miles. Elevations range from about 1,079 feet to almost 5,239 feet. The population includes about 373 km of stream with about 76 percent (284 km) occurring downstream from natural barriers. Upper Lolo Creek drains forested mountains and rolling hills of timber interspersed with meadows and fields. Lower Lolo Creek then flows into a narrow, rugged canyon that is largely inaccessible. The average annual precipitation in the area ranges from 25 inches at the Clearwater River mainstem (Orofino) to 43 inches in the rolling hills just north of the Lolo Creek drainage (Pierce) to 70 inches at Hemlock Butte at the headwaters of Lolo Creek (IDFG 1996). Lolo Creek can display wide amplitudes in seasonal stream flow from spring to late summer and fall. Normal peak streamflows are associated with winter snow melt and occur in the spring although rain-on-snow events sometimes occur in winter causing rapid runoff (Espinosa and Lee 1991, Ecovista 2003).

Land ownership within the population is about 51 percent USFS, 34 percent private, 11 percent state lands, and 3 percent BLM lands (Figure 5.2-6). USFS lands are continuous within the upper basin occupying most of the Yakus Creek, Eldorado Creek, Yoosa Creek, and Musselshell Creek watersheds. Private and state lands are intermingled within the Jim Brown Creek and lower Lolo Creek watersheds. BLM lands are generally concentrated in the lower watershed along Lolo Creek. The lower watershed is contained within a steep v-shaped canyon that is roughly 1,500 feet deep along much of its lower half, moderating to about half this depth by the time it reaches the Clearwater National Forest boundary (IDFG 1996).

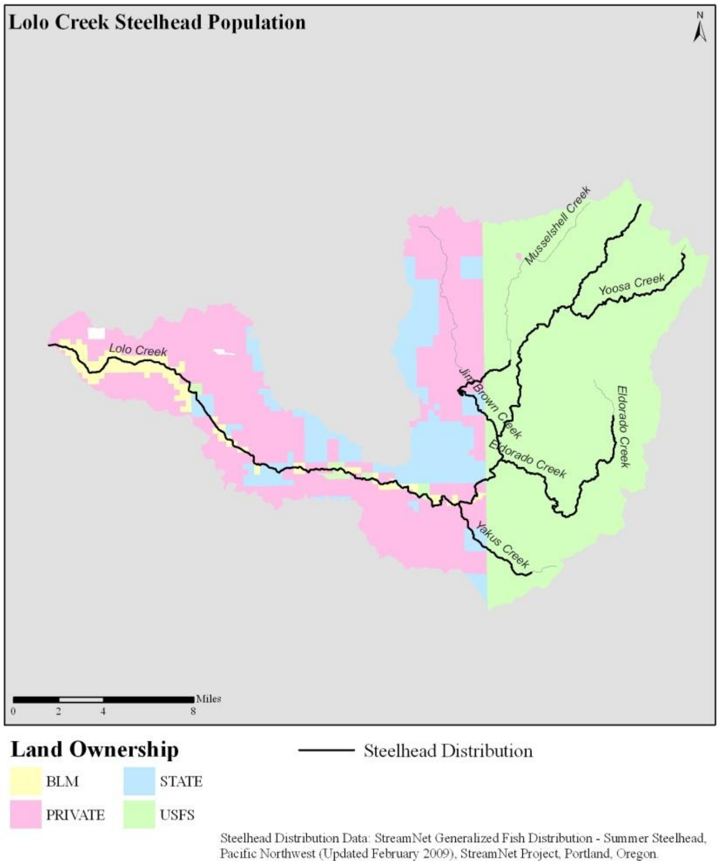


Figure 5.2-14. Land ownership in the Lolo Creek steelhead population.

Land use in the Lolo Creek watershed has included logging, mining, livestock grazing, and recreation. Timber harvest and road construction have had substantial impacts on stream habitat throughout the population, as have grazing and mining in localized areas. Extensive timber harvest and road construction began in 1957 and continued through the 1980s, by which point stream habitat conditions had become severely degraded (Espinosa et al. 1995). Sediment yield resulting from timber harvest and road construction increased from 60 to 149 percent over natural levels (Espinosa et al. 1995). Other impacts to stream habitat included channel impingement by roads and reduction in large woody debris recruitment to streams caused by the removal of riparian trees. Restoration projects to improve fish habitat in Lolo Creek began in the 1980s and included revegetation of riparian areas, bank stabilization projects, and placement of instream structures (Espinosa and Lee 1991).

The Clearwater Subbasin Assessment rated the quality of steelhead habitat in the Lolo Creek watershed as mostly fair or good (Ecovista 2003, p 281). Steelhead are distributed throughout most streams of the population (Figure 5.2-7), which consists of one major spawning area (Figure 5.2-14). In 1986, four basalt bedrock falls on lower Eldorado Creek were blasted to improve steelhead access to potential spawning and rearing habitat in Eldorado Creek (Espinosa and Lee 1991). The falls still create a partial barrier for upstream adult migration, but some returning steelhead get past the barrier.

IDEQ developed a list of impaired waters across the state of Idaho to comply with section 303(d) of the Clean Water Act. IDEQ's 2008 Integrated 303(d)/305(b) Report includes stream segments listed under section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA-approved TMDLs) (IDEQ 2009). The following table displays impaired streams segments for the Lolo Creek steelhead population and the impairments that prevent each stream reach from attaining its beneficial uses (Table 5.2-20). Although not all of these impaired stream reaches contain steelhead habitat or list impairments of direct concern to steelhead, we have included the full list in order to show the range of impairments to stream conditions within the Lolo Creek steelhead population.

Table 5.2-20. Stream segments in the Lolo Creek steelhead population identified from Sections 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)		
Eldorado Creek - source to mouth	Combined Biota/Habitat Bioassessments*	52.08
Jim Brown Creek - source to mouth	Sedimentation/siltation; Water temperature; Escherichia coli; Nutrient/Eutrophication Biological Indicators	50.14
Musselshell Creek - source to mouth	Combined Biota/Habitat Bioassessments	30.83
Musselshell Creek - Jim Brown Creek to mouth	Combined Biota/Habitat Bioassessments	4.33
Section 4c-Waters Impaired by Non-pollutants		
Jim Brown Creek - source to mouth	Other flow regime alterations; Physical substrate habitat alterations	44.63
Section 4a-TMDLs		
No TMDLs Segments		0.00

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

Current Habitat Limiting Factors: To determine the habitat limiting factors for the Lolo Creek steelhead population, NMFS reviewed multiple data sources and reports on stream conditions. Based on these reports and discussions with local fisheries experts, we conclude that the habitat limiting factors for the Lolo Creek steelhead population are migration barriers, sediment, riparian conditions, habitat complexity, and stream temperature. Table 5.2-21 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. A discussion of each limiting factor follows.

Table 5.2-21. Primary limiting factors identified for the Lolo Creek steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream
Riparian Condition	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Restoration of riparian vegetation and streambank stability
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool	Restoration of riparian vegetation and

	quality, and sufficient LWD reduces juvenile rearing and adult holding.	LWD recruitment potential
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature

1. Migration Barriers.

Most migration barriers for this population are caused by culverts at stream road crossings. The barriers block habitat access for juveniles and migrating adults.

A panel of local experts convened for the 2008 FCRPS classified migration barriers as a limiting factor for steelhead in all major Lolo Creek tributaries (citation). Clearwater National Forest subwatershed summaries indicate 43 known fish migration barriers and 20 undetermined barriers on roads on the National Forest, impairing access to at least 20 miles of stream (Table 5.2-22). Known migration barriers are created by road-stream crossings, with the exception of one barrier at a water diversion on Yoosa Creek (USFS 2007). The migration barriers in Table 5.2-22 are for both resident and anadromous salmonids, so some barriers may be upstream from potential steelhead habitat. On the other hand, these estimates do not include barriers located on private or state lands. Given the high road density throughout the watershed, multiple migration barriers likely occur on non-federal land as well. An assessment of potential migration barriers for steelhead throughout the watershed would provide guidance on priorities for restoring connectivity within the population.

Table 5.2-22. Subwatersheds identified with known or undetermined barriers that may affect spawning or rearing habitat for steelhead in the Lolo Creek watershed (USFS 2007).

Watersheds (HUC5)	Subwatersheds (HUC6)	Migration Barriers			Connectivity (miles)		
		Migration Barriers	Not a Migration Barriers	Not Determined	Connected Access	Impaired Access	Not Determined
	Upper Lolo Creek	17	14	5	42	5	1
	Musselshell	7	8	2	17	5	0
	Middle Lolo Creek	7	4	5	6	6	0
	Eldorado Creek	12	17	8	41	4	0
	Total:	**43**	**43**	**20**	**106**	**20**	**1**
Source: CNF Subwatershed summaries (USFS 2007)							

2. Excess Sediment.

The Clearwater Subbasin Assessment ranked sediment as one of the most important limiting factors for steelhead throughout this population (Ecovista 2003, p. 347). Fuller et al. (1985) identified sedimentation problems in Lolo Creek, Yakus Creek, Mussellshell Creek, Eldorado Creek, and Jim Brown Creek. IDEQ (2009) listed about 50 miles of the Jim Brown Creek watershed as sediment-impaired (Table 5, Figure 7). The panel of local experts convened for the 2008 FCRPS biological opinion identified roads, timber harvest, grazing, and historic mining as the principal causes of elevated sediment levels (FCRPS 2009). The panel concluded that excess sediment is affecting steelhead spawning and rearing success through reduced pool volume and reduced interstitial spaces within substrate used for spawning and rearing. Espinosa et al.? (1995) also indicated that the quantity and quality of winter habitat may be limiting anadromous salmonid habitat in the Lolo Creek watershed, likely due to the increase in sedimentation of pools and channel substrate that are important cover components during winter.

The Clearwater National Forest identified excess sediment as a risk to salmonid habitat in all subwatersheds of Lolo Creek with USFS land (USFS 2007). Table 5.2-23 ranks the potential for sediment to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). In most subwatersheds excess sediment was ranked as a moderate risk to spawning habitat. The primary source of excess sediment identified in all subwatersheds was streamside roads. Total road density and the density of roads within riparian conservation areas (RCAs) were high in all subwatersheds, with roads occurring in landslide prone areas of all subwatersheds except Musselshell Creek.

Table 5.2-23. Subwatersheds identified with excess sediment as a risk to salmonid habitat in the Lolo Creek watershed (USFS 2007).

HUC6-Subwatersheds	Life Stage	Risk Rank*	Primary Sources	Road Density (mi/mi^2)	
				Total	Within RCAs
Upper Lolo Creek	Spawning	2	Streamside Roads	5.16	5.52
Musselshell Creek	Spawning	2	Streamside Roads	5.46	6.24
Middle Lolo Creek	Spawning	2	Streamside Roads	4.73	10.05
Eldorado Creek	Spawning	1	Streamside Roads	5.04	5.72

Source: Clearwater National Forest subwatershed summaries (USFS 2007)
*1 - high risk, 2 - moderate risk, 3 - minor risk

Espinosa et al. (1995) chronicled sediment conditions in Lolo Creek and Eldorado Creek from 1957 to 1993. Sediment yield increased dramatically in the 1950s, in concert with extensive road construction and timber harvest, and remained high through 1983, when awareness of habitat and degradation problems helped to initiate a moderation of timber harvest and road construction activities on the Clearwater National Forest. Sediment yield decreased from 1977 to 1993, but substrate conditions showed little recovery towards natural conditions of substrate embeddedness and levels of subsurface fines. Espinosa et al. (1995) predicted that it would take many years for excess sediment to be transported out of the watershed, allowing substrate conditions to improve.

3. Degraded Riparian Conditions.

Conditions reported for the Lolo Creek steelhead population suggest that degraded riparian conditions are reducing population abundance and productivity. Ecovista et al. (2003) indicated that degradation of riparian habitat is a moderate limiting factor in the Lolo Creek steelhead population, leading to decreased stream shade and decreased channel complexity. Grazing has reduced riparian vegetation in the Jim Brown Creek watershed (FCRPS 2009). High road densities in riparian areas throughout the Lolo Creek watershed upstream from the lower canyon have also degraded riparian conditions (see Table 6). Fuller et al. (1985) recommended riparian enhancement projects in much of the Lolo Creek watershed to alleviate degraded stream conditions. Since that time riparian habitat restoration and protection has played a major role in restoration of fish habitat in the Lolo Creek watershed (Johnson 2010). The Nez Perce Tribe has recommended continued riparian restoration efforts in the Jim Brown Creek and Musselshell Creek drainages to improve vegetation density in order to increase shade and recruitment of large woody debris (Johnson 2010).

4. High Water Temperatures.
Elevated water temperatures may adversely affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions (Spence et al. 1996). The Clearwater Subbasin Assessment ranked stream temperature as an important limiting factor for steelhead in the Lolo Creek watershed (Ecovista et al. 2003, p. 346).

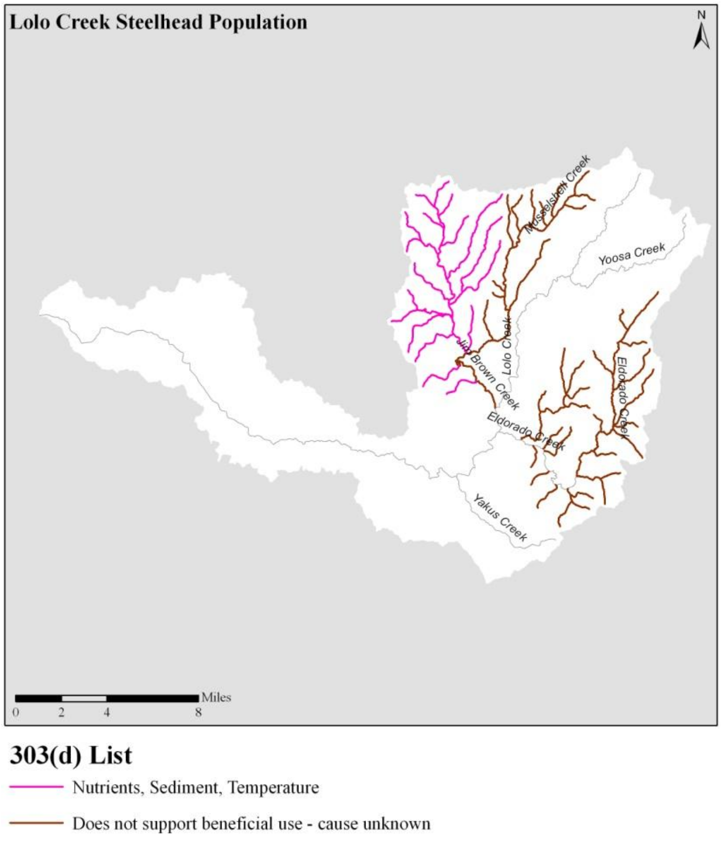


Figure 5.2-15. Stream segments in the Lolo Creek steelhead population identified from Sections 5, and 4c of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

In the Jim Brown Creek watershed, IDEQ currently lists about 50 miles of stream on the 303(d) list as impaired by high temperatures (Table 5, Figure 5.2-15). Cold water aquatic life criteria for maximum daily temperatures of 19°C average or 22°C instantaneous were exceeded for these streams. A panel of local experts on fisheries and aquatic habitat, convened for the 2008 FCRPS Biological Opinion, noted that loss of riparian vegetation is likely contributing to elevated stream temperatures in Lolo Creek, Eldorado Creek, and Musselshell Creek (FCRPS 2008). Espinosa et al (1995) noted that loss of riparian vegetation in Eldorado Creek has probably increased stream temperatures above natural conditions.

Monitoring data from the Clearwater National Forest (CNF) between 1990 and 2008 has indicated that stream temperatures in Lolo and Musselshell Creeks have exceeded the CNF desired criteria (16-17°C) by several degrees and maintained these high temperatures for extended periods of time (CNF 2008). In 2008, the CNF monitored stream temperatures throughout the summer at 19 sites on 17 streams on CNF land. The desired steelhead rearing temperature of 17°C was met at seven tributaries (Dutchman Creek, Knoll Creek, Mike White Creek, Fan Creek, Lunch Creek, Trout Creek, and Nevada Creek) but not at Lolo Creek, Eldorado Creek, or Musselshell Creek.

5. Loss of Habitat Complexity.
The Clearwater Subbasin Assessment ranked lack of instream cover and pools as a moderate limiting factor for steelhead in Lolo Creek (Ecovista 2003, p. 346). Loss of salmonid rearing habitat has occurred from a lack of woody debris, leading to less habitat complexity. Several subwatersheds in this population may lack sufficient sources of LWD recruitment. The Clearwater National Forest identified lack of woody debris as a risk to salmonid habitat in many areas of the Lolo Creek watershed (USFS 2007). Table 5.2-24 ranks the potential for reduced levels of LWD to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). Loss of instream woody debris was associated with the effects of streamside roads and timber harvest.

The risk ranking for woody debris was considered moderate in the Upper Lolo Creek and Eldorado Creek subwatersheds and high in the Musselshell Creek and Middle Lolo Creek subwatersheds.

Table 5.2-24. Subwatersheds in the Lolo Creek watershed in which lack of large woody debris is a risk to salmonid abundance and productivity (USFS 2007).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk to Salmonid Habitat	Primary Source	Secondary Source
Upper Lolo Creek	Rearing	2	Woody Debris	Streamside Roads	Timber Harvest
Musselshell Creek	Rearing	1	Woody Debris	Streamside Roads	Timber Harvest
Middle Lolo Creek	Rearing	1	Woody Debris	Streamside Roads	Timber Harvest
Eldorado Creek	Rearing	2	Woody Debris	Timber Harvest	Streamside
Source: Clearwater National Forest subwatershed summaries (USFS 2007)					

*1 - high risk, 2 - moderate risk, 3 - minor risk

Potential Habitat Limiting Factors and Threats: One potential concern has not yet risen to the level of a limiting factor, but needs to be managed to protect habitat access in the Lolo watershed.

- Passage barriers due to undersized culverts. The extensive road system in the Lolo Creek watershed includes numerous culverts at stream crossings, many of which were not designed to accommodate 50- or 100-year storm events. If a culvert is too small to accommodate high flows during a storm event, the stream may overtop the road, delivering large amounts of sediment downstream and potentially creating a migration barrier.

Hatchery Programs

[To be developed]

Harvest Management

[To be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next ten years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

Priority stream reaches: Because the Lolo Creek watershed consists of just one major spawning area, all streams with potential steelhead habitat are important for the recovery of the population. Based on intrinsic habitat potential, the greatest increases in abundance and productivity from habitat restoration would come from the Lolo Creek mainstem, Yoosa Creek, Musselshell Creek, and Yakus Creek (see Figure 1). Jim Brown Creek and Eldorado Creek could also be important for increasing steelhead productivity. The Nez Perce Tribe has expended considerable effort in fencing, riparian plantings, bridge replacement, road decommissioning, and culvert improvements in Jim Brown Creek.

Habitat actions: The following habitat actions, ranked in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population, moving the population towards a moderate risk status.

1. Restore habitat access and connectivity within the population by eliminating fish migration barriers. Actions should include restoring access to all potential steelhead habitat, inventorying remaining road crossings with undetermined status, and conducting routine maintenance and checks on existing passable structures.

2. Mitigate chronic sediment sources from roads. Controlling sources of sediment may require road obliteration, realignment, conversion or closure, as well as road maintenance and replacement of undersized culverts. Reducing the total amount of roads, particularly those that occur along streams and on unstable slopes, should reduce sediment production. Existing roads on the National Forest are being prioritized for decommissioning by a cooperative effort of the Nez Perce Tribe and the Clearwater National Forest (Johnson 2010).

3. Restore degraded riparian habitat through riparian plantings, fencing, and decommissioning of streamside roads. Passive restoration should be used in less disturbed areas to allow natural regrowth of riparian vegetation.

Implementation of Habitat Actions

Implementation of the habitat portion of the recovery plan for Lolo Creek steelhead will likely occur through the work of the Clearwater National Forest and the Nez Perce Tribe. BLM, IDEQ, IDFG, Idaho Department of Lands, county soil and water conservation districts, Potlatch Corporation and other private landowners are also likely to contribute. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watersheds.

Many stream habitat restoration projects have been completed in the Lolo Creek watershed, dating back to the 1980s (Espinosa and Lee 1991). The Lolo Creek Watershed Restoration Project began in 1996 to enhance fish habitat, reduce sediment delivery, and protect riparian areas (McRoberts 2003). Since then the Nez Perce Tribe, Clearwater National Forest, and Bonneville Power Administration have been active in restoration efforts in the Lolo Creek watershed. Restoration efforts have included fencing to exclude cattle for stream banks, stream bank stabilization, road decommissioning, riparian planting, and culverts replacement and removal (Table 5.2-25).

Table 5.2-25. Lolo Creek watershed restoration accomplishments from 1997-2009 (Johnson 2010).

Year	Road Decommissioning (miles)	Fence Construction (miles)	Bank Stabilization Projects	Riparian Plantings	Culvert Replacements	Culvert Removal
1997	12	4	0	0	0	0
1998	15	10	0	0	0	0
1999	29	2	0	0	0	0
2000	0	0	1	0	0	0
2001	0	0	3	2,000	2	0
2002	0	0	0	3,000	2	0
2003	0	0	0	3,335	2	4
2004	5	0	0	1,600	2	0
2005	2	0	0	2,100	6	4
2006	0	0	0	1,900	4	1
2007	0	25	0	1,800	3	0
2008	10	0	0	1,600	0	0
2009	28	0	0	960	2	2
Total	**101**	**41**	**4**	**18,295**	**23**	**11**

Table 5.2-26 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Lolo Creek steelhead population.

Habitat Cost Estimate for Recovery

The total cost of habitat recovery actions for the South Fork Clearwater population over the next 10 years is estimated to be $610,500. Cost estimates are from actual project costs completed as reported in the Lolo Creek Watershed Restoration statement of work from the Nez Perce Tribe.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 5.2-26. Recovery Actions Identified for the Lolo Creek Steelhead Population.

Recovery Actions Identified for the Lolo Creek Steelhead Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Jim Brown Creek	High summer water temperature, riparian conditions, migration barriers, sediment	Riparian fencing, planting, levee setbacks, streambank bioengineering	3 miles of riparian planting	3 miles @ $34,000= $104,000	None	0
Lolo Creek mainstem and smaller tributaries	Migration barriers	Culvert replacements	3 culvert replacements on Mud Creek and 1 on North Fork Mud Creek	4 x $60,000= $240,000.	None	0
	Sediment	Road obliteration and road drainage improvements	5.5 miles total of road improvements	5.5 x $ 15,000 per mile= $82,500	None	0
Musselshell Creek	Migration barriers	Musselshell stream relocation, culvert removals	Musselshell Tunnel Stream Restoration Project	$100,000	None	0
	Riparian conditions	Riparian rehabilitation	Ongoing fence maintenance (BPA funding)(16miles of fence)	$54,000	None	0
	Sediment	Road decommissioning, road drainage improvements, weed control	30 acres of riparian weed treatments	30 acres at $1,000 per acre= $30,000	None	0
Yoosa Creek	Sediment	Road decommissioning, road drainage improvements, weed control	9.6 miles of road improvements			
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**

5.2.6.5 South Fork Clearwater Steelhead Population

Abstract/Overview

The population is currently rated as not viable, with a high abundance/productivity risk. Its targeted desired status is Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Maintained

The actions identified in this recovery plan to occur over the next 10 years will likely move this population to its desired status. The monitoring and research information collected in the next 10 years will provide an important opportunity to complete a more detailed evaluation of the status of the species and will provide additional knowledge to guide the next round of actions under this recovery plan.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and DPS. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT's Snake River steelhead status assessment (ICTRT 2008).

Population Status

The Population Status section describes the population's current status as defined in the ICTRT's most current status assessment (ICTRT 2008) where they discussed risk in terms of four viability parameters: Abundance, Productivity, Spatial Structure and Diversity. Other available information was also considered. The section focuses primarily on population Abundance (the total number of adults) and Productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure (the amount and nature of available habitat) and Diversity (genetic traits) concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the Snake River steelhead status assessment (ICTRT 2008).

Population Description: The South Fork Clearwater population includes the South Fork Clearwater River and its tributaries upstream from and including Mill Creek and supports B-run fish (Figure 5.2-16) (ICTRT 2003). Spawning areas in this population are isolated from other spawning areas in the Clearwater River at a distance that likely precludes substantial straying. A dam on the South Fork Clearwater created a migration barrier 1949 to 1963, and the anadromous component of the population was extirpated. The current population is derived from resident rainbow trout, juvenile stocking from

Dworshak Hatchery stock, adults trapped at Lewiston Dam (Kiefer et al. 1992), and possibly residualized (resident) endemic *O. mykiss*.

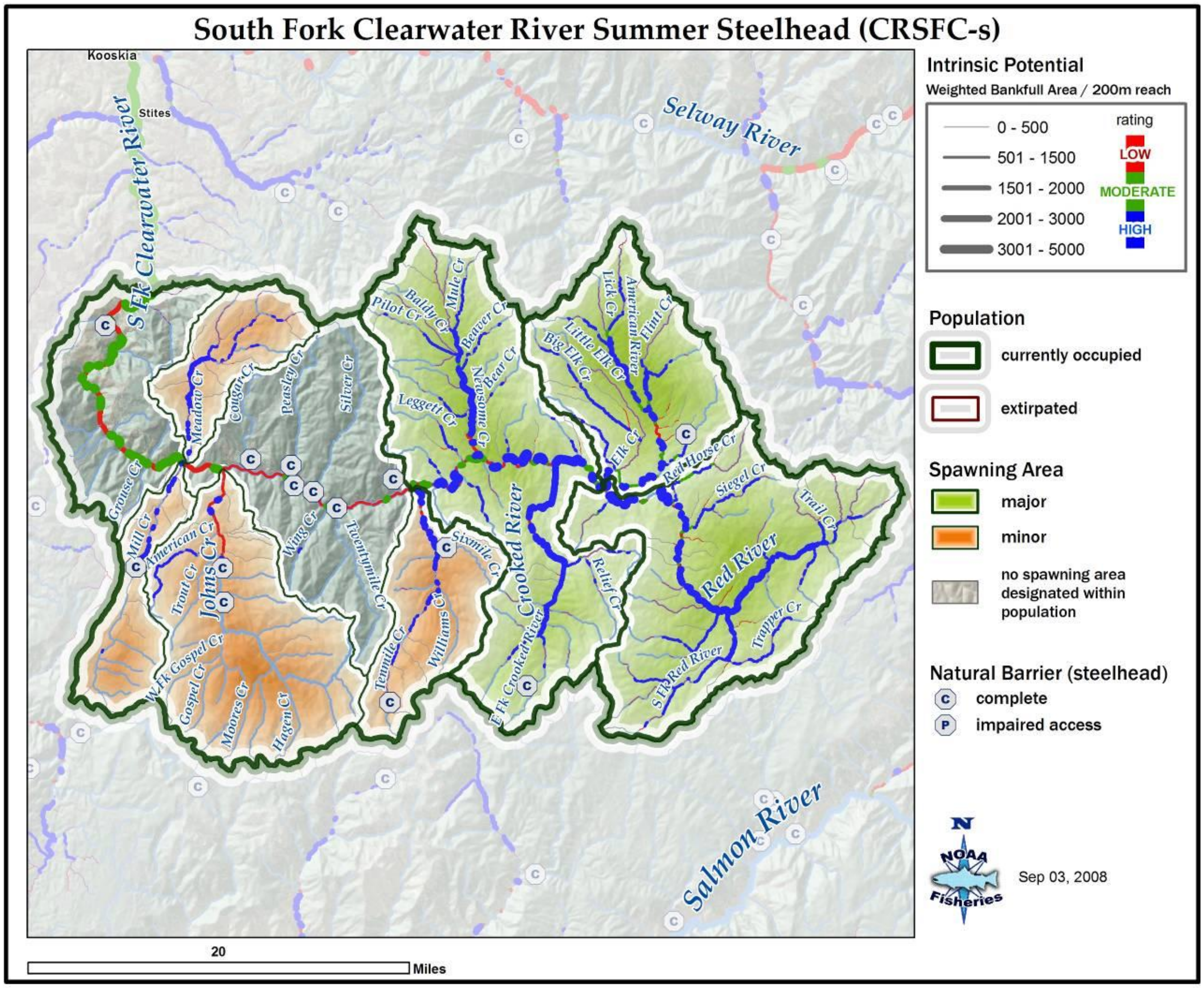


Figure 5.2-16. South Fork Clearwater River steelhead population, with major and minor spawning areas.

The ICTRT classified the South Fork Clearwater River population as "intermediate" in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve low (a 5% or less) risk of extinction over a 100-year timeframe.

Abundance and Productivity: The Idaho populations of Snake River steelhead do not have direct estimates of annual spawning escapements. Preliminary estimates were generated for an average population abundance and productivity for these populations using annual counts of wild steelhead passing Lower Granite Dam. Estimates were developed for two average surrogate populations to represent both major run types (A and B). These abundance and productivity estimates were then compared to a viability curve for an intermediate-sized Snake River steelhead population (requiring a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner). The surrogate population for B-run steelhead above Lower Granite Dam has an estimated recent abundance of 345 and productivity of 1.09. It is rated as high risk based on current abundance and productivity as shown in Figure 5.2-17. The point estimate representing current status lies just below the 25 percent risk curve for intermediate-sized Snake River steelhead populations, indicating a greater than 25 percent risk of extinction over a 100-year timeframe. More specific information about how the abundance and productivity estimates were calculated is included in the ICTRT's steelhead status assessment, Appendix B-1 *Calculating Representative Abundance and Productivity Estimates for Snake River A- and B-run Steelhead Populations*.

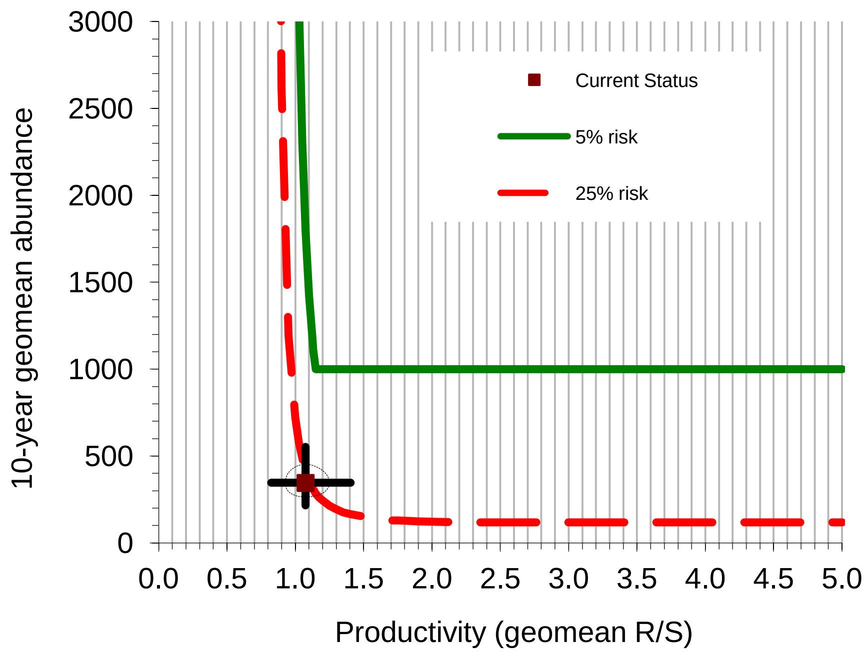


Figure 5.2-17. Snake River B-run surrogate steelhead population current estimated abundance and productivity (A/P) compared to DPS viability curve (1986-2005). Ellipse = 1 SE about the point estimate. Error bars = 90% CI for A, 98% CI for P.

Spatial Structure: The South Fork Clearwater population has three major spawning areas and four minor spawning areas, and this extensive spawning structure provides inherent protection against extinction. Current spawning is widely distributed throughout the population and has been documented in all of the larger tributaries to the South Fork Clearwater River, including all major spawning areas. The population's spatial structure score is therefore low risk. A low spatial structure risk is adequate for the population to attain its overall desired status.

Diversity: For the South Fork Clearwater, diversity risk is primarily driven by the long history of outplanting hatchery steelhead into this population. Steelhead fry, fingerlings, smolts and adults have been released into the population since at least 1969. The majority (possibly up to 100%) of released fish have been Dworshak Hatchery B-run stock. Some of the hatchery fish releases are for harvest augmentation, and there is substantial harvest of these fish within and outside of the population. All fish released for harvest augmentation are marked with an adipose fin clip. In recent years, unclipped hatchery steelhead smolts were released for supplementation purposes, and these releases are expected to continue into the near-term. The contribution of supplementation releases and unharvested marked hatchery fish to natural production is unknown, but the duration of supplementation releases and the potential for the naturally spawning population to consist of a high proportion of hatchery-origin fish creates diversity risk, leading to a cumulative diversity risk of moderate. This diversity risk is sufficiently low for the population to meet its overall desired status.

Summary: The South Fork Clearwater steelhead population is currently at high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT's average surrogate B-run population passing Lower Granite Dam. In the absence of population-specific data, we assume that improvements in abundance and productivity will need to occur for this population to reach its desired status of maintained, with moderate risk. The overall spatial structure and diversity rating of moderate is sufficiently low for this population to reach its desired status. However, improvement of this rating to low risk, along with significant improvements in the abundance and productivity rating, would be necessary to allow this population to achieve a status of viable, with low risk. Table 5.2-27 summarizes the population's abundance/productivity and spatial structure/ diversity risks. A complete version of the ICTRT's draft status assessment for Snake River Basin steelhead populations is available upon request from the National Marine Fisheries Service.

Table 5.2-27. Viable Salmonid Population parameter risk ratings for the South Fork Clearwater steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	**HV**	**HV**	**V**	M
	Low (1-5%)	**V**	**V**	**V**	M
	Moderate (6 – 25%)	M	M	M	**HR**
	High (>25%)	**HR**	**HR**	**HR** South Fork Clearwater River	**HR**

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Section 5.1.1 summarizes regional-level factors that affect all Idaho Snake River steelhead populations.

Natal Habitat

Habitat Conditions: The South Fork Clearwater River steelhead population includes the South Fork Clearwater River and its tributaries upstream from Mill Creek. The drainage area within this steelhead population is about 2,252 km^2 (869 mi^2). There are about 1,339 km of stream within the South Fork

Clearwater River population with about 63 percent (847 km) occurring downstream from natural barriers (Table 1). Major watersheds within the South Fork Clearwater River include Newsome, Elk, Johns, Mill, and Crooked Creeks and American and Red Rivers. Tributaries of the South Fork drain a diverse area of forested mountains, rolling hills, and steep stream and river canyons. The climate varies from hot and dry at lower elevations to more cool and moist mountainous areas.

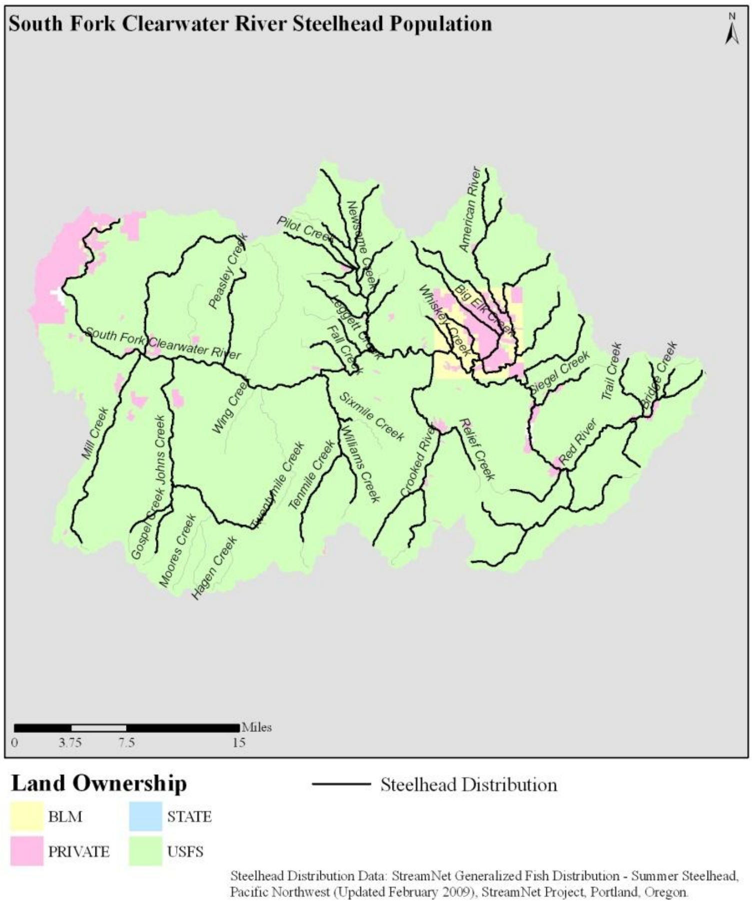


Figure 5.2-18. Landownership pattern within the South Fork Clearwater River steelhead population.

Steelhead are distributed throughout most streams of the population, with the most extensive distribution in the tributaries of the upper basin (Figure 5.2-18). The ICTRT identified three major (Upper South Fork, Newsome, and American) and four minor (Meadow, Johns, Tenmile, and Mill) spawning areas. The quality of steelhead habitat varies from excellent (Johns Creek) to poor (lower South Fork Clearwater) throughout the South Fork Clearwater population (Ecovista 2003, p. 281). Newsome Creek, American River, and Red River were rated as having fair-to-good habitat quality.

Land ownership within the population boundaries is primarily USFS (92%) with private, BLM, and state lands making up the remaining 8 percent (Figure 4). Private landownership is scattered but most of it occurs along the lower South Fork Clearwater mainstem, around the town of Elk City in the American River drainage, and along the Red River. BLM lands occur exclusively in the Elk City area in the Whiskey Creek, Elk Creek, and American River watersheds. Land use in the South Fork Clearwater has included mining, logging, livestock grazing, recreation, development, and road construction. Mining was historically a major land use, and the South Fork has the most extensive history of placer mining of any area in the Clearwater River basin. Major tributary systems were dredged, and hydraulic mining was common throughout the South Fork Clearwater. Increased sedimentation, stream channelization, and riparian degradation have occurred in areas where mining, logging, and road building has occurred.

Steelhead in this population were blocked by a dam constructed on the South Fork Clearwater River near the town of Harpster, about two miles downstream from the population's lower boundary. In 1911, the dam was constructed to provide power to the city of Grangeville. A fish ladder was installed in 1935 and remained until 1949, when it was destroyed by high water. The dam blocked steelhead migration into this population from 1911 to 1935, and from 1949 until 1963, when the dam was finally removed. Today, steelhead found in the upper South Fork Clearwater probably originate from recolonization (straying), reintroduction efforts, and *O. mykiss* that survived as resident forms when the dam was in place.

IDEQ developed a list of impaired waters across the state of Idaho to comply with section 303(d) of the Clean Water Act. IDEQ's 2008 Integrated 303(d)/305(b) Report includes stream segments listed under section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA-approved TMDLs) (IDEQ 2009). The following table displays impaired streams segments for the South Fork Clearwater steelhead population and the impairments that prevent each stream reach from attaining its beneficial uses (Table 5.2-28). Although not all of these impaired stream reaches contain steelhead habitat, we have included the full list in order to show the range of impairments to stream conditions within the South Fork Clearwater River steelhead population.

Table 5.2-28. Stream segments in the South Fork Clearwater River steelhead population identified from Sections 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)		
No locations listed	---	---
Section 4c-Waters Impaired by Non-pollutants		
SF Clearwater River - sidewall tributaries	Physical substrate habitat alterations	46.75
SF Clearwater River - Johns Creek to Butcher Creek	Physical substrate habitat alterations	23.17
SF Clearwater River - Tenmile Creek to Johns Creek	Physical substrate habitat alterations	11.78
SF Clearwater River - Crooked River to Tenmile Creek	Physical substrate habitat alterations	28.39
SF Clearwater River - tributaries	Physical substrate habitat alterations	2.49
SF Clearwater River - 5th order mainstem segment	Physical substrate habitat alterations	6.69
Schwartz Creek	Other flow regime alterations	44.47
Huddleson Creek and tributaries	Physical substrate habitat alterations	33.91
Granite Creek	Physical substrate habitat alterations	4.08
Section 4a-TMDLs		
South Fork Clearwater River mainstem and tributaries[1]	Water temperature	2,221
Granite Creek	Sedimentation/Siltation	8.16
Huddleson Creek and tributaries	Sedimentation/Siltation	67.82
Schwartz Creek	Sedimentation/Siltation	44.47
SF Clearwater River - 5th order mainstem segment	Sedimentation/Siltation	13.38
SF Clearwater River - Crooked River to Tenmile Creek	Sedimentation/Siltation	56.78
SF Clearwater River - Crooked River to Tenmile Creek	Sedimentation/Siltation	23.52
SF Clearwater River - Johns Creek to Butcher Creek	Sedimentation/Siltation	46.34
SF Clearwater River - sidewall tributaries	Sedimentation/Siltation	46.75
SF Clearwater River - Tenmile Creek to Johns Creek	Sedimentation/Siltation	23.56
SF Clearwater River - tributaries	Sedimentation/Siltation	4.98

Current Habitat Limiting Factors: To determine the habitat limiting factors for the South Fork Clearwater River steelhead population, NMFS reviewed multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, we

[1] IDEQ developed temperature TMDLs for almost all stream segments in this population, with the exception of the high elevation reaches in the Johns Creek watershed. See Figure 5.

conclude that the habitat limiting factors for the South Fork Clearwater steelhead population are riparian conditions, elevated stream temperatures, migration barriers, sediment, and habitat complexity. Table 5.2-29 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. The following section discusses each of the limiting factors, using information from the USFS, IDEQ, and the Clearwater Subbasin Assessment and Management Plan (USFS 2006, IDEQ 2003, Ecovista 2003).

Table 5.2-29. Primary limiting factors identified for the South Fork Clearwater River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Riparian Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Revegetation of riparian areas
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Restoration of riparian vegetation to increase LWD recruitment to streams over time

1. Degraded Riparian Conditions.

Conditions reported for the South Fork Clearwater River steelhead population suggest that degraded riparian conditions are reducing population abundance and productivity in many areas. Recognizing the need to improve riparian conditions throughout the subbasin, IDEQ (2003) established shade targets for much of the South Fork Clearwater. As described in the section on temperature above, the prevalence of poor riparian conditions throughout the South Fork that has occurred from various landuse activities (i.e., historic dredge mining, road construction, and grazing). A panel of local experts in fisheries and aquatic habitat emphasized the importance of riparian habitat restoration in the American River, Red River, Newsome Creek, middle and upper South Fork Clearwater, and Crooked Creek watersheds (FCRPS 2009). The loss of riparian vegetation has reduced recruitment of large woody debris to stream channels, which has also reduced habitat complexity. The Nez Perce National Forest (2007) estimated that placer and dredge mining have removed riparian vegetation along 30 miles of stream in the upper section of the South Fork Clearwater River around Elk City. Ecovista et al. (2003) rated riparian habitat degradation as one of the most important limiting factors for salmonids in the South Fork Clearwater.

2. High Water Temperature.

Conditions reported for the South Fork Clearwater River steelhead population suggest that elevated temperatures are reducing population abundance and productivity.

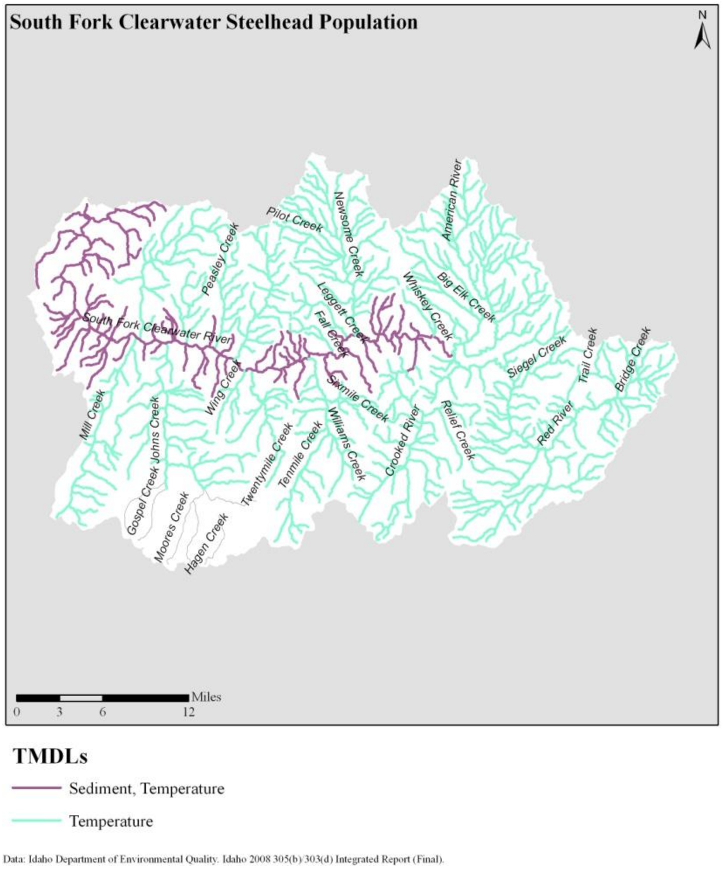


Figure 5.2-19. Stream segments in the South Fork Clearwater River steelhead population identified from Section 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Stream temperature was ranked by the Clearwater Subbasin Assessment as one of the most important limiting factors for steelhead in this population, and elevated temperatures appear to be widespread throughout the watershed (Ecovista 2003, p. 347). IDEQ established temperature TMDLs for most stream reaches in this population, totaling about 2,221 miles of stream (Table 1, Figure 5.2-19). Many of the streams evaluated by IDEQ (2003) exceed both the cold water aquatic life and salmonid spawning criteria (see IDEQ 2003, Appendix J).

IDEQ (2003) recorded elevated stream temperatures all along the mainstem South Fork Clearwater, as well as in some tributaries, during the summers of 1999 through 2001. Tributary temperatures observed at the mouths of the American and Red Rivers were particularly high, at greater than 72ºF weekly maximum temperature. These two streams combine to form the headwaters of the South Fork Clearwater River, leading to high stream temperatures in the uppermost reach of the mainstem river. IDEQ (2003) observed that stream temperatures in the mainstem then appeared to decrease slightly as the river travels downstream. This slight drop in temperature indicates that much of the excess heat loading in the upper mainstem is the result of heat loading from the headwater tributaries, likely from both natural and human caused processes. Human-caused heat loading in the American and Red Rivers is largely a result of the loss of shade–producing riparian vegetation caused by grazing, road construction, dredge mining, and timber harvest (IDEQ 2003). Water temperatures are relatively stable moving further down the South Fork Clearwater mainstem, until a dramatic increase occurs downstream from the population boundaries. Agricultural and other land use activities occurring in the lower South Fork Clearwater basin have led to very low shade conditions along tributary streams.

In developing temperature TMDLs for the South Fork Clearwater, IDEQ (2003) established shade targets as surrogates for water temperature. State temperature criteria for salmonids were exceeded at some time in all streams monitored within the subbasin. Despite extensive mining, logging, grazing, and road-building in some parts of the South Fork drainage, many other tributary stream reaches are relatively unimpaired by human land uses. IDEQ (2003) therefore assumed that many streams in the drainage probably exceed the numeric temperature criteria naturally. In place of numeric temperature targets, shade targets were set to restore stream shading to conditions representing minimal human impact. Because the influence of shade on stream temperature is much more significant on smaller streams with smaller water volumes than on larger streams, IDEQ (2003) concluded that management of tributary conditions is the most effective method to reduce stream temperature in the mainstem South Fork Clearwater. Shade improvements are needed across all land use and ownership categories.

3. Migration Barriers.

Migration barriers have been identified in many of the subwatersheds of the South Fork Clearwater River steelhead population (Table 5.2-30). In subwatershed summaries presented by the Nez Perce National Forest (2007), there were numerous known (33) and undetermined (100) barriers associated with stream-road crossings. Many of the known and undetermined barriers exist within subwatersheds that are designated as major spawning areas of the South Fork Clearwater steelhead population. Some of these barriers may be upstream from potential steelhead habitat, but many are likely blocking access to suitable steelhead rearing habitat and possible steelhead spawning habitat. An assessment of potential migration barriers that focuses on steelhead would provide guidance on priorities for restoring connectivity within the population. An expert panel of local biologists concluded that passage barriers were a limiting factor for steelhead in the American River, Red River, Crooked Creek, Newsome Creek, and Meadow Creek watersheds, as well as in other smaller tributaries to the South Fork Clearwater (FCRPS 2009).

Table 5.2-30. Subwatersheds identified with known or possible barriers that may affect migration in the South Fork Clearwater River (USFS 2007).

HUC6-Subwatersheds	Life Stage	Risk Rank	Known Barriers		Undetermined Barriers		Primary Source
			Number	Miles	Number	Miles	
Middle Red River	Migration	1	4	3	18	20	Road Crossings
South Fork Red River	Migration	2	3	3	4	27	Road Crossings
Upper Red River	Migration	2	3	5	15	33	Road Crossings
Elk Creek	Migration	3	0	0	4	5	Road Crossings
Upper American River	Migration	3	1	0	4	5	Road Crossings
South Fork Clearwater River-Leggett Creek	Migration	3	2	5	16	14	Road Crossings
South Fork Clearwater River-Peasley Creek	Migration	3	1	8	6	2	Road Crossings
Tenmile Creek	Migration	3	0	0	1	3	Road Crossings
Twentymile Creek	Migration	3	0	0	1	4	Road Crossings
Lower Crooked River	Migration	1	0	0	3	2	Road Crossings
Upper Crooked River	Migration	3	4	2	4	26	Road Crossings
Lower Newsome Creek	Migration	2	0	0	8	18	Road Crossings
Upper Newsome Creek	Migration	3	0	0	5	37	Road Crossings
Lower Johns Creek	Migration	1	0	0	0	0	Road Crossings
Meadow Creek	Migration	1	9	10	3	0	Road Crossings
Mill Creek	Migration	2	6	13	5	0	Road Crossings
South Fork Clearwater River-Grouse Creek	Migration	2	0	0	3	1	Road Crossings
		Total:	**33**	**49**	**100**	**197**	

4. Reduced Habitat Complexity and Channel Morphology.
The quality and complexity of habitat in the South Fork Clearwater River steelhead population have been reduced by channel and floodplain modification and loss of instream woody debris and LWD recruitment potential. The Nez Perce National Forest (USFS 2007) identified channel modification and reduced levels of large woody debris as risks to salmonid habitat in many subwatersheds of the South Fork Clearwater River. No habitat risks were identified for Upper Johns Creek and Gospel Creek, which are in the Gospel-Hump Wilderness, but habitat problems exist in all other subwatersheds. Table 5.2-30 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to assess the potential for either channel modification or lack of large woody debris to limit the abundance of different salmonid life stages (rearing, spawning or both). Current or past land uses were identified that contribute to these habitat modifications and to potential native aquatic population declines.

Channel modification and simplification most commonly resulted from historic dredging mining, affecting both rearing and spawning habitat quality. Secondary sources for channel modification were related to roads crossings and streamside roads. Channel modification was ranked mostly as a moderate or high risk to salmonid habitat. Lack of instream woody debris and sufficient sources for woody debris recruitment were indentified in many subwatersheds as affecting the quality of rearing habitat and, to some extent, spawning habitat (Table 5.2-31). Lack of woody debris was most often associated with roads and dredge mining although timber harvest was noted as the primary source in the lower Red River subwatershed. Insufficient woody debris was mostly ranked as a moderate or high risk to salmonid habitat.

Table 5.2-31. Subwatersheds in the South Fork Clearwater River population in which degraded habitat quality is a risk to salmonid abundance and production (USFS 2007). Primary and secondary sources of habitat degradation were identified for different life stages (rearing, spawning, or both).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk	Primary Source	Secondary Source
Elk Creek	Rearing	2	Channel Modification	Dredge Mining	None
		2	Woody Debris	Dredge Mining	Road Crossings
	Spawning	3	Channel Modification	Dredge Mining	Road Crossings
Lower American River	Rearing	1	Channel Modification	Dredge Mining	Streamside
		2	Woody Debris	Dredge Mining	Streamside
	Spawning	2	Channel Modification	Dredge Mining	Streamside
Lower Crooked River	Rearing	1	Channel Modification	Dredge Mining	Streamside
		1	Woody Debris	Dredge Mining	Streamside
	Spawning	2	Channel Modification	Dredge Mining	Streamside
Lower Newsome Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside
		1	Woody Debris	Dredge Mining	Road Crossings
	Spawning	2	Channel Modification	Dredge Mining	Road Crossings
Lower Red River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Timber Harvest	Streamside Roads
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Meadow Creek	Both	1	Woody Debris	Road Crossings	Streamside Roads
Middle Red River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Dredge Mining	Timber Harvest

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk	Primary Source	Secondary Source
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Mill Creek	Both	2	Woody Debris	Streamside Roads	Road Crossings
South Fork Clearwater River-Grouse Creek	Rearing	2	Channel Modification	Dredge Mining	Road Crossings
	Spawning	3	Channel Modification	Dredge Mining	Road Crossings
South Fork Clearwater River-Leggett Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Dredge Mining	Road Crossings
	Spawning	2	Channel Modification	Dredge Mining	Road Crossings
South Fork Clearwater River-Peasley Creek	Rearing	2	Woody Debris	Streamside Roads	Road Crossings
	Both	2	Channel Modification	Streamside Roads	Road Crossings
		2	Woody Debris	Streamside Roads	Timber Harvest
	Spawning	2	Woody Debris	Streamside Roads	None
Upper American River	Rearing	2	Channel Modification	Grazing	None
		2	Woody Debris	Dredge Mining	Streamside Roads
Upper Crooked River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Road Crossings
	Spawning	1	Channel Modification	Dredge Mining	Road Crossings
Upper Newsome Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Timber Harvest
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Streamside Roads	Timber Harvest
	Both	2	Channel Modification	Streamside Roads	Road Crossings

*1 - high risk, 2 - moderate risk, 3 - minor risk

A panel of local experts in fisheries and aquatic habitat, convened for the 2008 FCRPS biological opinion, also noted habitat quality concerns within the South Fork Clearwater populations. For the American River, Red River, Crooked River, and Newsome Creek watersheds, the panel identified reduced habitat complexity, loss of pools or reduction in pool depth, and loss of riparian vegetation as limiting factors for steelhead (FCRPS 2009).

Mitigation efforts to remove and stabilize mine tailings, glory holes, and waste rock deposited in the stream channel and floodplains, along with stream channel rehabilitation, have shown improvement in stream channel and habitat quality in the Crooked and Red Rivers (Siddall 1992).

5. *Excess Sediment*.

Conditions reported for the South Fork Clearwater River steelhead population suggest that sediment is reducing population abundance and productivity. Elevated sediment levels are a widespread concern for this population, and ranked by the Clearwater Subbasin Assessment as one of the most important limiting factors for South Fork Clearwater steelhead (Ecovista 2003, p. 347). The Nez Perce National Forest (USFS 2007) identified excess sediment as a risk to salmonid spawning and rearing in many subwatersheds of the South Fork Clearwater River (Table 5.2-31). Table 5.2-32 ranks the potential for sediment to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). Primary and sometimes secondary sources of sediment were identified. These sediment sources contribute to aquatic habitat modifications or population declines for aquatic species. Excess sediment was indicated as a high or moderate risk in most subwatersheds, with sediment concerns distributed throughout much of the major spawning areas. The primary sources of sediment for most subwatersheds were road crossings and streamside roads. In addition to roads, secondary sources of sediment also included grazing, timber harvest, wildland fire, and historic dredge mining. Both dredge mining and hydraulic mining have influenced sediment dynamics in the South Fork Clearwater. From 1900 into the 1940s, hydraulic mining resulted in 20 to 30 large open pits throughout the South Fork drainage. The pits can be over 15 acres in size and contribute thousands of tons of sediment to the South Fork system each year.

Table 5.2-32. Subwatersheds in the South Fork Clearwater River in which sediment is a risk to salmonid abundance and production (USFS 2007). Primary and secondary sources of excess sediment were identified for the habitat for different salmonid life stages (rearing, spawning, or both).

HUC6-Subwatersheds	Life Stage	Risk Rank*	Primary Sources of Sediment	Secondary Sources of Sediment
Lower Red River	Both	1	Road Crossings	Streamside Roads
Middle Red River	Both	1	Road Crossings	Streamside Roads
South Fork Red River	Both	1	Road Crossings	Timber Harvest
Upper Red River	Rearing	2	Facilities	None
		1	Road Crossings	Streamside Roads; Timber Harvest
	Spawning	1	Road Crossings	Timber Harvest
East Fork American River	Both	1	Road Crossings	Streamside Roads
Elk Creek	Both	1	Road Crossings	Dredge Mining
Lower American River	Both	1	Road Crossings	Grazing
Upper American River	Rearing	1	Road Crossings	Streamside Roads
	Spawning	1	Road Crossings	Grazing
Silver Creek	Both	3	Road Crossings	None
South Fork Clearwater River-Leggett Creek	Both	1	Road Crossings	Streamside Roads
South Fork Clearwater River-Peasley Creek	Rearing	2	Streamside Roads	Road Crossings
	Spawning	2	Streamside Roads	Road Crossings
South Fork Clearwater River-Wing Creek	Both	3	Road Crossings	Streamside Roads
Tenmile Creek	Both	3	Road Crossings	None
Twentymile Creek	Both	3	Road Crossings	None
Lower Crooked River	Both	1	Streamside Roads; Timber Harvest	Road Crossings; Dredge Mining
Upper Crooked River	Rearing	2	Road Crossings	Streamside Roads
	Spawning	2	Road Crossings	Dredge Mining
Lower Newsome Creek	Both	1	Streamside Roads	Road Crossings
Upper Newsome Creek	Both	1	Road Crossings; Streamside Roads	Dredge Mining; Grazing
Lower Johns Creek	Both	2	Streamside Roads	Road Crossings
Meadow Creek	Both	1	Streamside Roads	Grazing
Mill Creek	Both	2	Road Crossings	Streamside Roads
South Fork Clearwater River-Grouse Creek	Rearing	2	Road Crossings	Dredge Mining
	Spawning	3	Road Crossings	Dredge Mining
South Fork Clearwater River-Lightning Creek	Both	2	Streamside Roads	Road Crossings

*1 - high risk, 2 - moderate risk, 3 - minor risk

IDEQ's sediment TMDL includes about 336 miles of stream in South Fork Clearwater River steelhead population. Sediment concerns are widespread throughout the population, but TMDLs listings are concentrated within the mainstem South Fork Clearwater and lower tributaries. Within this population the sediment reductions needed to achieve the TMDL allocations will likely come from stream bank erosion control and road maintenance (South Fork Clearwater Watershed Advisory Group 2006).

Potential Habitat Limiting Factors and Threats: Two potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect habitat in the South Fork Clearwater watershed.

1. Mineral exploration and development — Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters.

2. Catastrophic fires — Extensive standing dead timber from insect outbreaks and disease makes the landscape susceptible to catastrophic wildfire, which could increase sediment delivery to streams. Preventing catastrophic fires may require aggressive fuels treatments that involve the removal of insect-killed conifers in addition to prescription burning.

Hatchery Programs
[To be developed]

Harvest Management
[To be developed]

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next ten years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

Priority stream reaches: First priority stream reaches for habitat restoration are those with intrinsic potential steelhead habitat in the American, Newsome, and Upper South Fork Clearwater major spawning areas (see Figure 1). These watersheds contain nearly 85 percent of the modeled intrinsic habitat potential for the population. The second tier of priority stream reaches for restoration efforts are tributaries in the population's minor spawning areas: Meadow, Tenmile, Mill, and Johns Creeks (habitat in Johns Creek is in excellent condition and may not require recovery actions). The third priority for habitat restoration efforts is the South Fork Clearwater mainstem. The South Fork Clearwater mainstem provides important spawning, rearing, and migration habitat for the population. However, improvements in sediment and temperature conditions, which are limiting the quality of the mainstem habitat, will most likely come from habitat restoration in tributaries. State Highway 14 runs the length of the South Fork mainstem, precluding restoration of natural riparian conditions along one side of the river.

Habitat actions: Habitat in relatively good condition, such as the Johns Creek watershed, should continue to be protected. Habitat in many other parts of the population, particularly the steelhead major spawning areas in the upper watershed, will require recovery actions. The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed.

1. Improve riparian conditions throughout the population in order to increase shade and thereby reduce summer stream temperatures and in order to reduce sediment delivery to streams. Manage livestock to minimize impacts to riparian vegetation and streambanks. Reestablishing riparian vegetation will also lead to increased large wood recruitment to streams, over the long-term.

2. Eliminate known artificial fish migration barriers blocking steelhead access to potential habitat, mainly at road stream-crossings. Inventory road crossings throughout the population to identify additional steelhead migration barriers.

3. Restore stream channels and floodplain function in reaches impacted by historic dredge mining and other land uses in the Newsome, Crooked, American, and Red River watersheds. Many of these stream reaches have straightened channels, infrequent pools, inadequate pool depth, inadequate riparian vegetation, and reduced habitat complexity, including lack of cover (FCRPS 2009). Projects may include restoring natural floodplain meander patterns by reconnecting historic meanders or reconstructing stream channels.

4. Mitigate chronic sediment sources from roads and mining. Controlling sources of sediment from roads may require road realignment, closure, or obliteration, or erosion control measures at stream crossings. Reducing sediment from historic mine sites may require the removal or stabilization of mine tailings and waste rock deposited in the stream channel and floodplains.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the Nez Perce National Forest, the Nez Perce Tribe, IDFG, IDEQ, the Idaho County Soil and Water Conservation District, BLM, and private landowners, among other interested parties. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the population. These groups have a record of implementing salmonid habitat conservation projects in this drainage and in other areas within the state.

Many habitat restoration projects have already been completed in the South Fork Clearwater. Some projects date back to the 1980s (Siddall 1992). IDEQ (2003) provides a detailed list of past projects included fencing, riparian and stream bank restoration, grazing management plans, sediment control measures, road management (decommission, stabilization, closure), and trail restoration improvements. The Nez Perce National Forest, the Nez Perce Tribe, Idaho County Soil and Conservation District, IDFG, and others have been involved in multi-year projects to restore stream channels heavily impacted by dredge-mining. Table 5.2-33 describes habitat recovery actions recently completed as part of the 2008 FCRPS habitat component.

Table 5.2-33. Recent FCRPS habitat actions (2007-2009) completed in the South Fork Clearwater River steelhead population (FCRPS 2009).

Meadow Creek Assessment Unit Rock Creek culvert replacement • 3.2 miles of stream access returned Riparian planting • 3 miles total of riparian stream planting 55 miles of soil restoration and 12.4 miles road decommissioning • Whitman Creek Soil Restoration 22.0 miles; False Creek I Soil Restoration 16.0 miles • Meadow Face II Road Decommissioning 12.4 miles • Orchard Creek Soil Restoration 17.0 miles
Mill Creek Assessment Unit 9.6 miles total of stream access returned • Hepner Creek Culvert Replacement - 3.8 miles of stream access returned • Merton Creek Culvert Replacement - 3.8 miles of stream access returned • Big Canyon Culvert Replacement - 2.0 miles of stream access returned Riparian planting and LWD recruitment • 3 miles total of riparian stream planting; long-term LWD recruitment
Newsome Creek Assessment Unit Culvert replacement 6 miles of stream access returned • Mare Creek culvert replacement, 3 miles • Mule Creek culvert replacement, 3 miles Road improvements and decommissioning • 19.5 miles of road improvement • 18 miles of road decommissioning
Red River Assessment Unit Stream restoration • Red River Narrows Stream Restoration Project, 2 miles 5 miles of stream access returned • 1709 culvert replacement, 5 miles of stream access returned • Design completed for 5 additional crossings Riparian planting and revegetation • 16 streambank miles planted; 9 acres total of additional revegetation Conservation easement acquisition • 271 acre conservation easement Road decommissioning • 22 miles of road

Table 5.2-34 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the South Fork Clearwater River steelhead.

Habitat Cost Estimate for Recovery

The total cost of habitat recovery actions for the South Fork Clearwater population over the next 10 years is estimated to be $ 3,967,500.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 5.2-34. Recovery Actions Identified for the South Fork Clearwater Steelhead Population.

Recovery Actions Identified for the South Fork Steelhead Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
American River	Migration barriers	Culvert replacements	1 culvert replacement	$60,000		
	Sediment	Road decommissioning, road improvements	At least 5 miles of road decommissioning	5 miles @ $15,000 = $75,000		
	Riparian conditions	Revegetation	Conservation easement on 149 acres, with some riparian planting possible.	No estimate		
Crooked River	Channel morphology (straightened channel, lack of pools, reduced pool depth, lack of complexity, lack of cover)	Stream channel and riparian rehabilitation	Lower Crooked River Narrows stream restoration project (3.5 miles), Crooked River Meanders stream restoration project	3.5 miles @ 34,000 = $119,000		
	Migration barriers	Culvert replacements	3 culvert replacements	3 @ 60,000 = $180,000		
	Riparian conditions	Revegetation	4.2 miles total of streambank planting; 1 acre total of additional planting	4.2 miles @ $34,000 = $142,000		
	Sediment	Road Decommissioning, road Improvement, culvert removal or replacement	Replace 1 undersized culvert to reduce blow-out potential	$100,000		
Meadow Creek	Migration barriers	Culvert replacement	1 culvert replacement, and 1 culvert removal	2 @ $60,000 = 120,000		
	Riparian conditions	Revegetation	3 miles of riparian planting	3 @ 34,000 per mile = $102,000		
	Sediment	Road decommissioning, soil restoration, culvert removal or replacement, upland revegetation	26 miles total of soil restoration; 14 miles total of road decommissioning; 110 acres total of upland vegetation planting.	14 Miles @ $15,000 = $210,000		
Mill Creek	Migration barriers	Culvert replacements	1 bridge replacement and 1 culvert replacement	1 bridge @ $ 120,000 1 culvert @ $60,000		
	Riparian conditions	Revegetation	3 miles of riparian planting	3 @ $34,000 = $102,000		
	Sediment	Road improvement	0.2 miles landslide restoration; 8	Landslide - $100,000		

Recovery Actions Identified for the South Fork Steelhead Population.						
			miles road decommissioning.	8 @ $15,000 per mile $120,000		
Newsome Creek	Channel morphology (straightened channel, lack of pools, reduced pool depth, lack of complexity, lack of cover)	Stream channel and riparian rehabilitation	2.4 miles of stream channel restoration	2.4 miles @ $133,000 = $319,200		
	Riparian conditions	Revegetation	3.7 streambank miles and 5 additional acres of planting	3.7 miles @ 34,000 = $125,800 5 @ $15,000 = $75,000		
	Sediment	Road decommissioning, road improvement, culvert removal or replacement	25 miles of road decommissioning	25 @ $15,000= $375,000		
Red River	Habitat complexity	Placement of instream structures	Placement of LWD and creation of log jams over 5 miles of stream; 2.6 miles of other channel improvements	$130,000		
	Migration barriers	Culvert replacements	1 culvert replacement	$60,000	3 additional culvert replacements for steelhead access	
	Riparian conditions	Revegetation	20 miles of streambank planting; 15 acres of additional revegetation	20 @ 34,000= $680,000 15 @ $15,000 = $225,000		
	Sediment	Road decommissioning, road Improvement, culvert removal or replacement	24.5 miles of road decommissioning	24.5 @ 15,000 = $367,500		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2010 to 2020**	**Cost for Identified Projects**	**Actions/Projects Beyond 2020**	**Project Costs Beyond 2020**